JULY 1960

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Electrical South

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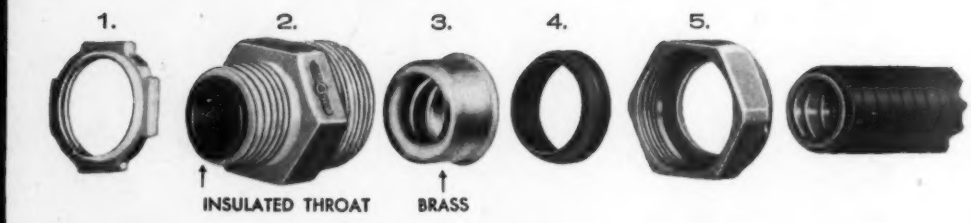

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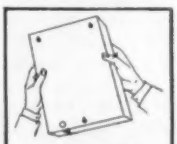

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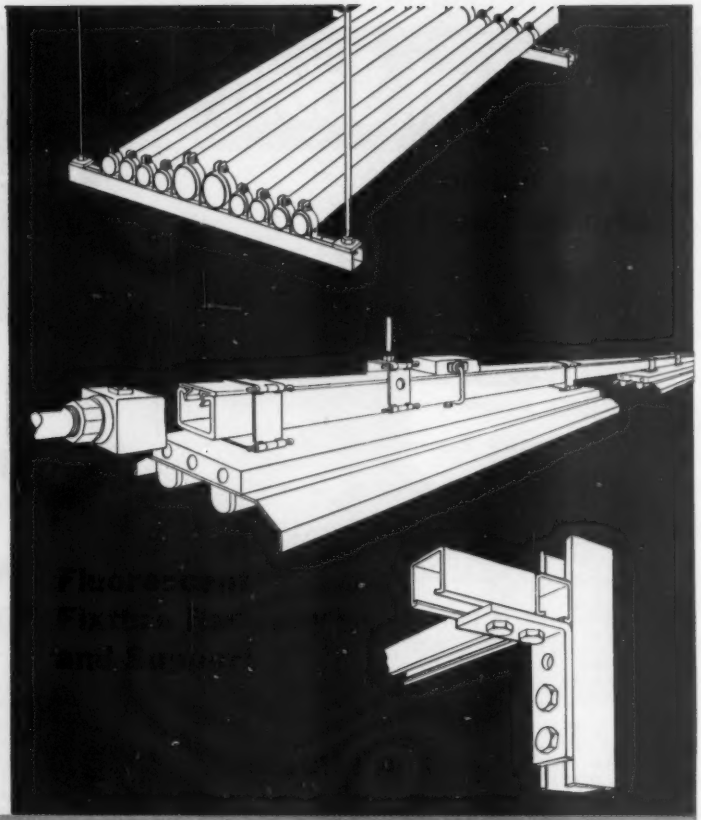

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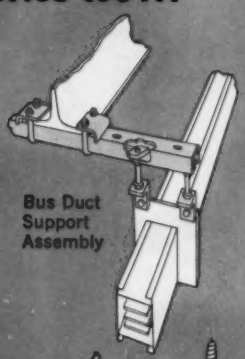

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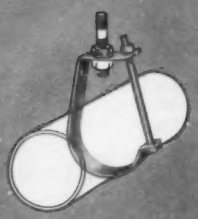

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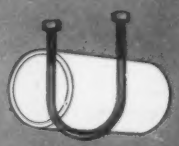

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

New concepts in plant location

One of the more rapidly growing businesses today is that of plant location. It is no longer a simple task to choose a location where a business can grow and flourish but rather, because of the huge investment required in the development of such a plant, the process of selection is approached with almost scientific exactness. It is true that a general regional area may be considered more favorably than all others, but when it comes to specific site selection, trained personnel take over the task.

The completed process of site selection may take weeks of thorough investigation and require voluminous research reports covering practically all phases of the social, economic, and political life of the community. Multiply this by the number of locations under consideration, and the extent of the job becomes readily apparent. No wonder that industry now relies heavily on studies performed by independent research personnel who specialize in such investigations.

Of course, many companies maintain talented specialists in the ranks of their own executives. This is especially true where a company is going through a period of rapid expansion or where they may need to find new quarters due to economic and other conditions in their present locale. Such employees, however, often boil down potential plant locations to a half dozen or less and determine, in broad and general terms, that these areas fill the bill most effectively in terms of company policy.

In practically every case, they could efficiently determine the precise location that should be utilized by the company. As a matter of policy, however, it is often wise to substantiate the decision of internal personnel through the eyes of independent observers, thus bringing to light potentially favorable or unfavorable factors that may have been overlooked. Many such factors may seem unimportant in terms of present company practices but, over the years of anticipated growth, may take on added impact that could mean the success or failure of the business enterprise.

Thus, the vision of specialists plus the economic and business factual knowledge of the company's own personnel make an almost unbeatable combination for proper plant location.

Influence of educational facilities

Not many years ago, the presence of academic facilities was not of paramount importance as a plant location factor. Certainly, many businesses were located near college and university facilities, but this was often happenstance rather than the result of analytical planning. Some importance was given to the presence of sound elementary and secondary schools because employees' children needed these levels of education. But the value of a college or university was often unrecognized and was classed, perhaps, as a luxury that might or might not have site value.

Now many companies *require* that plant locations be established within relatively easy reach of good institutions of higher education. And the reasons for this cannot always be transcribed into dollars and cents benefits. It is true that a company that specializes in basic or applied research, or that uses the results of such research in its daily affairs, could well estimate the monetary value of a nearby college. In such instances, the location in proximity to a university would be sound economics and good business.

But business managers will say today that there are other reasons less real that make such a location preferable to one far removed from educational opportunity. A few of these somewhat intangible, yet sensible, reasons might be (1) the opportunity for employees to develop themselves for greater responsibility, (2) the opportunity for wives of employees to gain benefits from advanced education, (3) the opportunity to gain consulative services from talented faculty members in special areas, (4) the opportunity for greater social experience for company personnel, and (5) the opportunity that always comes from good adult-level programs that enhance the employees' abilities and knowledge. There are many other benefits that may accrue to the company that considers location near educational institutions.

The better business climate approach

It has become increasingly evident to business managers over the last few years that there is such a thing as a "business climate." This concept might best be described as the sum total of environmental factors in a community (economic, social and political) that tend to control or shape the opportunities for business success.

Moreover, there is the added climatic factor of the interest and willingness of established business leaders to work toward a better condition which would be more helpful to business growth.

In the past, this concept has often been neglected as a factor in the selection of a new business location. As a result, a company might spend many thousands of dollars in plant construction and the recruitment of a labor force, only to find that the chances were all against success from the very beginning due to a bad business climate.

The evaluation of a business climate requires a thorough knowledge of a community and the motivational factors behind it. It needs an analysis of people and institutions and the social forces at work, if it is to be as informational as it should be. It is for this basic reason that many of the professional plant location firms have organized their activities around skilled personnel who have the ability to un-

(Continued on page 122)

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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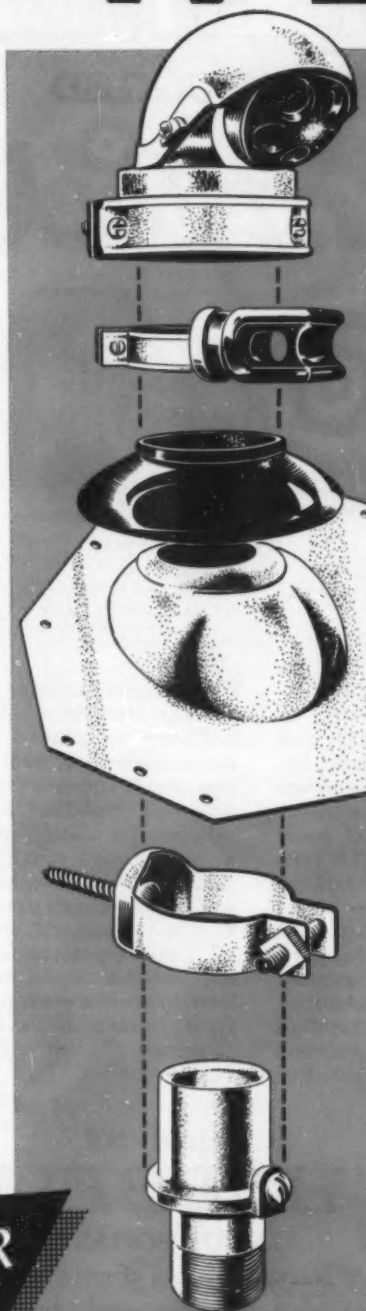

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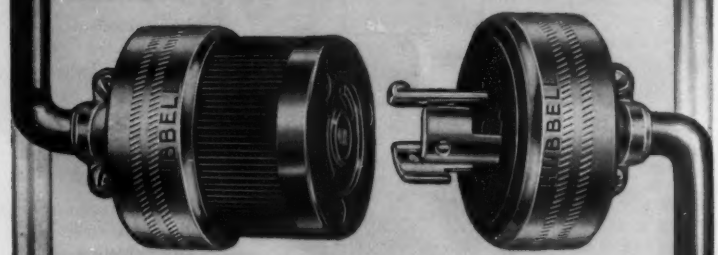

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Articles are wanted in two principal classifications:

Wiring and Lighting: **Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

Utility Engineering: **Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

Electrical South
806 Peachtree,
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Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Labor board bans IBEW discrimination

IN A CASE involving a New York IBEW local, the National Labor Relations Board showed that its ban on discrimination because of non-union membership extends beyond hiring and firing.

The Board ordered Local 25 (which bargains with the Nassau and Suffolk Chapter of NECA) to end arrangements under which:

—It had sole authority to rotate workmen and prescribe the apprentice-journeyman ratio.

—Only union members installed or maintained temporary lighting or power work.

—Union membership was a condition of eligibility for benefits provided by the IBEW Local 25 Welfare Fund, Vacation Fund, Holiday Fund, and Tool Allowance Fund.

—Employees were required to pay the union a percentage of their wages as a condition of job referrals or employment.

—It could cause discrimination in hiring of non-members of the union.

Census Bureau finds 220,000 lost houses

CONTRACTORS have built tens of thousands more homes each year than Government figures give them credit for, the Census Bureau reports. In fact, in 1956 the Government missed 220,000 homes.

Last year when the Government said 1,378,000 homes were erected there were actually 175,000 more built, according to the Census Bureau.

Because of these discrepancies, the Census Bureau is taking over the housing count. The Bureau explains that the old system was based on reports of building permits issued. But tens of thousands of homes were built without permits, both in areas where permits are required and in areas where they are not. The Bureau's new technique relies mainly on samplings of actual construction across the country.

The new figures do not represent an increase in volume of construction, just a better method of counting. Uncle Sam has started giving credit to construction contractors for all the work they do.

Construction spending decreases from 1959

NEW CONSTRUCTION expenditures rose 10 per cent during May, the U.S. Department of Commerce reports. Total spending was $4.5 billion.

The total is five per cent less than in May of 1959, and the cumulative value of construction expenditures in the first five months of 1960 amounts to $19.6 billion, 2 per cent below that for the same period of 1959.

Commerce Department economists now say that the substantial construction increase which they predicted for 1960, six months ago, may not materialize.

They point out that contract awards for the first four months of the year are eight per cent under a year ago. Housing dropped sharpest, 14 per cent. The economists expect that with mortgage money for home building easing up, housing starts will pick up during the last part of 1960. Even so, they do not expect total expenditures for new construction this year to surpass 1959.

Position on expenses clarified by IRS

THE INTERNAL Revenue Service says that under some circumstances employees away from home for more than one year may deduct travel and living expenses from taxes. Up to now the Service has ruled they cannot.

You might want to tell your employees that the Service has now somewhat relaxed this rule. The Service gave two examples of employees whose absences from home of more than one year would be considered temporary, not permanent.

Case 1—"He is not regularly or continuously employed by any single concern. He is a member of the local union for his trade in a particular city and maintains his regular abode in or near the city. He usually works in and around the city when work is available, but at times because of a shortage of work there or for other valid business reasons, he accepts employment elsewhere for various periods. The locations and durations of his employment require him to obtain lodging near each project site, but none of his distant employments is expected to extend or does in fact extend for as long as one year at any particular occasion."

Case 2—" . . . He maintains his regular place of abode in or near the city of his local union and usually obtains his referrals there for procuring employment at other locations. [No job is expected to extend for as long as one year.]"

An important consideration is whether the claimed abode is the worker's regular residence. Another is whether he takes distant jobs for business or personal reasons. The Service says that for these itinerant types of workers it goes by the facts, case-by-case.

Labor board ruling on illegal picketing

THE NATIONAL Labor Relations Board at Washington forbade the Steelworkers Union to force members of IBEW Local 136 off construction of a multi-million dollar sintering mill near Birmingham, Ala.

Jackson Electric Company had a sub-contract to help build the new mill for the Tennessee Coal and Iron Division of the U. S. Steel Co. IBEW Local 136 supplied the journeymen electricians.

After pickets from the Steelworkers trying to get the work forced AFL-CIO building tradesmen off the job, the construction unions, including IBEW Local 136, carried the case to the Labor Board.

The Board held that in picketing

(Continued on page 122)

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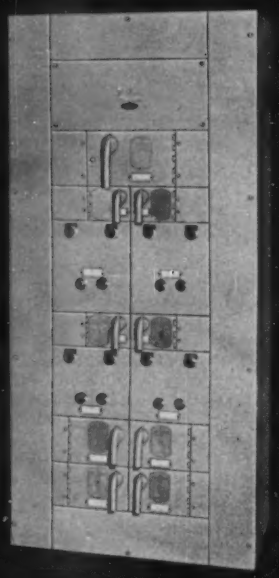
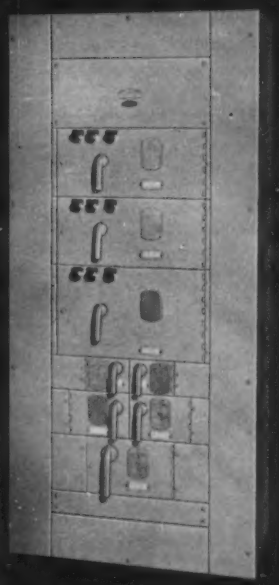


Typical S-A-W Distribution Panelboard showing 2 Non-Combination Plug-In Starters.

Branches: 30 to 600 Amps.
Mains: 250 to 1000 Amps.



Typical S-A-W Distribution Panelboard showing 3 Combination Plug-in Starters.

Branches: 30 to 600 Amps.
Mains: 250 to 1000 Amps.

All in a single panelboard Plug-in starters plus plug-in switches or circuit breakers! No separate space-wasting motor controls where only a few starters are needed.

Saves money on equipment—saves space—saves time on installation. All wiring between disconnect and starter is done at the factory.

Safety interlock between starter and disconnect. Starter door cannot be opened with disconnect in "On" position.

Handle padlock feature whether starter is for circuit breaker or fusible panelboard.

Two-Coil overload relays are standard on all starters. Three-coil relays available if preferred.

Heater coils furnished without extra charge if specified on order.

Optional Accessories: START and STOP pushbuttons—ON and OFF pilot lights—extra electrical interlocks.

Completely assembled panelboards are available promptly from factory.

FRANK ADAM ELECTRIC COMPANY *SINCE 1891*

P. O. Box 357, Main P. O., St. Louis 66, Mo.

busduct • panelboards • switchboards • service equipment • safety switches • load centers • Quikheter

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

FITTINGS AND FIXTURES—Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.
Write in No. A101 on card, pg. 17

ELECTRICAL BOXES—Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.
Write in No. A102 on card, pg. 17

STEEL WIRE—Technical information on Alumoweld, a newly developed aluminum-covered steel wire and strand, is contained in a 12-page catalog, just issued by the Wire and Cable Division of Copperweld Steel Co., 322 Frick Building Pittsburgh 19, Pa. Illustrated and documented with engineering data, the colorful catalog provides a complete working knowledge of this new material—its properties, advantages, applications and construction practices.
Write in No. A103 on card, pg. 17

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings and box connectors for both armored and nonmetallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N.Y.
Write in No. A104 on card, pg. 17

CONSTRUCTION ANCHORS—"Anchoring for Power and Communications Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.
Write in No. A105 on card, pg. 17

SERVICE PANELS — Information on protective electric control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.
Write in No. A106 on card, pg. 17

ELECTRICAL FITTINGS—Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.
Write in No. A107 on card, pg. 17

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150 St., Cleveland 11, Ohio.
Write in No. A108 on card, pg. 17

GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I. covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealers catalogs may be secured from Royal distributors.
Write in No. A109 on card, pg. 17

CARBON PRODUCTS—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.
Write in No. A110 on card, pg. 17

POWER BENDER — The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.
Write in No. A111 on card, pg. 17

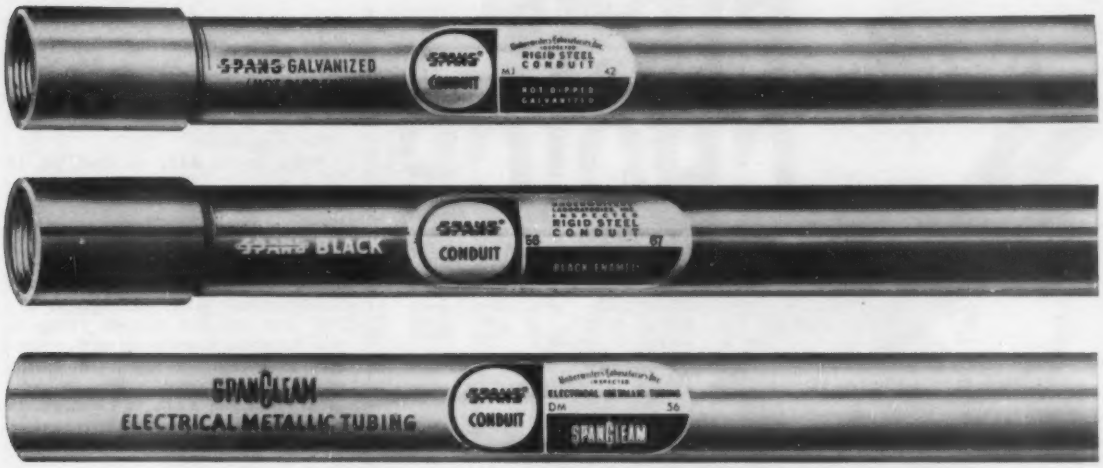
ELECTRICAL EQUIPMENT—The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog 58' Guide, containing data on their line of Safety Switches, Service Equipment, Distribution Panels, "E-Z-RED" Circuit Breakers, interchangeable and non-interchangeable, also wiring troughs.
Write in No. A113 on card, pg. 17

COMPRESSION CONNECTORS — New and fully illustrated Bulletin 13 offered by the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., shows their complete line of Squeezon compression fittings. They make all overhead distribution connections from line wire to ground rod on aluminum, ACSR, copper, or combinations of them. Application and installation data are given for tap connectors of several types; service entrance, splicing, jumper and repair sleeves; terminals, stirrups and ground fittings. Mechanical and hydraulic installing took for both dead and hot line work are listed.
Write in No. A114 on card, pg. 17

SELECTING FUSES — A 12-page descriptive handbook "Fuseology tells how to get safest most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. A115 on card, pg. 17

LIGHTING FIXTURE DATA—The Perfeclite Co., 1457 East 40th Street, Cleveland 3, Ohio, makes available the following literature: (1) Data Folder 54-B—4 pages of engineering information, prices and specifications on Plastic Indirect Concentric Ring Luminaires. (2) Data Folder EX-57—10 pages of information on Exit Units for all building locations. Complete Engineering data and prices given. (3) Data Folder 56-A—Information on Ceiling Pan Fixtures and Vapor Proof Prismatic Exterior Fixtures. (4) Data Folder 58-A on Concrete Mounting Boxes for recessed incandescent units. (5) Data Folder 58-B on Fluorescent Exit Units. (6) Data Folder 58-C on Phosphorescent Exit Units. (7) Data Folder 57-A on extra shallow recessed units and square ceiling pans. (8) Catalog 956—60 pages plus 12-page supplement, complete with descriptions and engineering information. (9) Data Sheet 57-D—a two-page description of square ceiling pan units and exterior conduit mounted-pan-type units.
Write in No. A117 on card, pg. 17

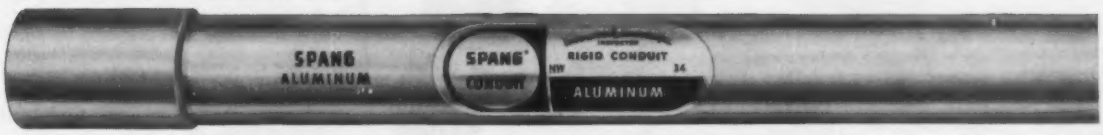
ELECTRICAL FITTINGS—Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, traps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. & W. Electric Mfg. Co., East Palestine, Ohio.
Write in No. A120 on card, pg. 17



the top-quality SPANG® Conduit Line...

... of SPANG rigid steel conduit and electrical metallic tubing has earned a reputation over the years as the top-quality conduit line for fast, efficient, economical and trouble-free electrical wiring protection.

now includes SPANG® Aluminum Conduit!



Good news for you! SPANG now offers top-quality SPANG Rigid Aluminum Conduit to provide you with a new complete line of SPANG Conduit Products. SPANG Rigid Aluminum Conduit, Couplings and Elbows are available in a full range of sizes from ½" through 6".

SPANG rigid steel conduit, electrical metallic tubing and rigid aluminum conduit are all produced under strict quality-control methods, thoroughly tested and inspected before shipping, and packaged for convenience and safety—assuring you of a top-quality, uniform conduit for every type installation.

For those installations where engineering dictates the use of rigid aluminum conduit, you can now give consideration to SPANG Rigid Aluminum Conduit with the same confidence as you would consider any SPANG Steel Conduit product. They're *all* top-quality!

Your local SPANG Distributor is looking forward to providing you with one-stop service for all your conduit needs. He has the complete line of SPANG Steel and Rigid Aluminum Conduit Products, and he's always prepared to give you top-quality service. Give him a call!

SPANG® CONDUIT

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation

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among men who know portable cord!

Yes, more electrical contractors and maintenance men specify Royal than any other portable cord in its class! Why? The reason is simple, but important to men with jobs that depend on the quality, safety and durability of the flexible cord they use: every foot of ROYAL cord and cable meets the high-performance standards you need on the job.

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Next time you order cords, specify ROYAL . . . preferred by electrical men everywhere!

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REPRESENTATIVES:
Cary Chapman & Co., Atlanta—New Orleans—Greensboro—Birmingham
Suchman Associates, Inc., Miami
NuRo Company, Houston—Dallas—San Antonio

CABLE CONNECTORS — Tomic Sales and Engineering Co., 20000 Sherwood Ave., Detroit 34, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

Write in No A121 on card, pg. 17

WIRING DEVICES — A complete new catalog of wiring devices is now available from Bell Electric Co., 5735 S. Claremont Ave., Chicago 36, Ill. The line includes a wide range of weatherproof receptacles and switches, portable garden light, wall plates, and specialty items.

Write in No. A122 on card, pg. 17

PLUG-IN REELITE — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc., Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

Write in No. A124 on card, pg. 17

WIRING PRODUCTS — Various features of J&S Despard interchangeable wiring devices and detailed information concerning this line are offered in a brochure released by Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y. Included are such features as Camstrap for quick, easy installation, three-wire grounding, and pressure terminal devices.

Write in No. A125 on card, pg. 17

FLUORESCENT BALLASTS—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

Write in No. A126 on card, pg. 17

GUTH INDUSTRIAL LIGHTING BROCHURE — New 8 page, 4 color brochure by The Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Missouri, describes Guth KOLORKODED industrial lighting fixtures. This unique innovation of color coding luminaires opens a new field in industrial lighting. Folder includes photographs, lighting data, engineering information and complete descriptive data on KOLORKODED

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and you'll never settle for ordinary switches again!

LEVITON A.C.
TOUCH SWITCH

Installs in any position...small enough to fit any gem box and standard wall plate ...and notice that quiet, "love tap" operation! Leviton's new 15A—120-277V. AC Touch Switch is a natural for homes, schools, apartments, office buildings, hospitals, industrial plants...anywhere! Tap it from any position, any angle!

CHECK THESE SPECIAL FEATURES:

SAFE OPERATION—install vertically, horizontally or upside down, yet a gentle tap gives positive, non-stalling action. Can't hang up...in any position. Special heavy silver contact points increase safety margin, prolong service life.

EASY INSTALLATION—side wired for convenience. Only 1" in depth. Large head brass terminal screws, backed out and staked, accommodate up to No. 10 conductors. Mounting screws are locked in straps ready-to-install. Interchangeable with any standard switch and wall plate.

HIGH CAPACITY—will accommodate high inductive loads of fluorescent systems, or full rated capacity of incandescent filament lamp loads. Take full load currents up to 80% of the switch rating for motor control.

RUGGED CONSTRUCTION—simplified construction and advanced design assure maximum efficiency, long life under heavy duty use . Heavy gauge steel plaster ear straps are riveted to housing for permanent assembly.

Creatively engineered and subjected to exhaustive "in-use" tests, Leviton AC Quiet Switches have proven themselves ideal for the new 4-wire electrical systems requiring switches rated at 277 volts. Available with brown or ivory button.

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Your best jobs are done with... **LEVITON**

Leviton Manufacturing Co., Brooklyn 22, New York • Chicago • Los Angeles • Leviton (Canada) Ltd., Montreal.
For your wire needs, contact our subsidiary AMERICAN INSULATED WIRE CORP. Pawtucket, R. I.

luminaires and standard RLM reflector units. Write for your free copy.
Write in No. A127 on card, pg. 17

WIRING DEVICES — Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible use in Industrial, Commercial and Residential applications.
Write in No. A128 on card, pg. 17

ELECTRICAL CONDUITS — "National Electric Conduits" is the 20-page Catalog No. 603 which describes and illustrates the many types of electrical conduits manufactured by National Electric Div., H. K. Porter Co. Porter Bldg. Pittsburgh 22, Pa.
Write in No. A129 on card, pg. 17

ANCHORING DEVICES—An illustrated 32-page catalog, No. 70, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.
Write in No. A131 on card, pg. 17

CONNECTORS — Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 10-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installing tooling.
Write in No. A132 on card, pg. 17

CONDUIT FITTINGS—A new 24-page catalog, illustrating a complete line of conduit fittings, oval bodies type LB, LL, LR, and T, and lighting parts is now available from Elliott Electric Products Co., 1513 Olmstead Ave., New York 62, N. Y.
Write in No. A133 on card, pg. 17

ANTI-CORROSIVE PAINTS—Subox, Inc., Fairmount Plant, Hackensack, N. J., announces the availability of literature on their lines of anti-corrosive paints and coatings, Subox paints give protection for years and largely eliminate the need for scraping and repriming when repainting.
Write in No. A135 on card, pg. 17

INFORMATION CENTER

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Electrical South

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ATLANTA 8, GEORGIA

PRESSURE CONTACT SWITCH— An 8-page folder (101-K) and a 4-page folder (200-EK) are available from the Kelek Company, 59 Davis Avenue, Norwood, Mass., describing their Kam-Lok Pressure Contact Switch, open and enclosed models, respectively, for high-capacity use with current-limiting fuses for 250 and 480 volt service entrance applications from 1200 to 6000 amperes.

Write in No. A136 on card, pg. 17

CONDUIT: With Rigid Polyvinyl Chloride Electrical Conduit gaining increasing popularity in the electrical field, Kraloy Plastic Pipe Co., Inc. offers a new, complete 20-page catalog. Included are comprehensive test results, specifications information, installation instruction, corrosion resistant charts, and other valuable data. Write Kraloy Plastic Pipe Co., Inc., Electrical Conduit Division, 402 West Central Avenue, Santa Ana, California.

Write in No. A137 on card, pg. 17

ELECTRICAL EQUIPMENT — A new 12-page pictorial bulletin briefly describes manufacturing facilities and electrical products of Crouse-Hinds Co., Syracuse 1, N. Y. Emphasis is on the variety of equipment available in the four product lines: Condulet electrical equipment, floodlights, aviation lighting equipment, and traffic control.

Write in No. A138 on card, pg. 17

CONDUIT FITTINGS — A new catalog describing their line of conduit fittings is now available from L. E. Mason Co., Boston 35, Mass. The illustrated, looseleaf-type folder contains information on design features, specifications, ordering, prices, and shipping.

Write in No. A143 on card, pg. 17

AERIAL CABLES — A 32-page booklet from Southern Electrical Co., P. O. Box 989, Chattanooga, Tenn., explains how Compresto Cables and PLM Products' "Wrap Around" spacers can be combined in a compact spaced aerial cable system. Design, voltage drop, sag and tension, and short circuit current are also covered.

Write in No. 144 on card, pg. 17

WIRING DEVICES — A complete new illustrated catalog and price book is now available from E. M. Wiegmann and Co., Inc., Freeburg, Ill., covering their line of outlet and switch boxes, cut-out and pull boxes, wireholders and racks, and service entrance equipment.

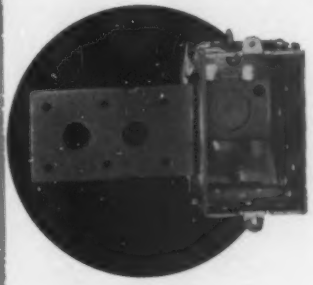
Write in No. 145 on card, pg. 17

SPARKY SAYS: THE WIEGMANN LINES ARE MY CHOICE!

Approved and preferred by electricians, contractors and architects everywhere.

SWITCH AND OUTLET BOXES:

Over 250 stock items from the simplest nail-up switch box, to nine gang boxes. All popular sizes of knockouts and types of clamps. Brackets are riveted (not spot welded) to boxes for maximum strength. Combination box and bar sets that save time and money for the contractor. All packaged in sturdy cartons with attractive, descriptive, easily read labels.



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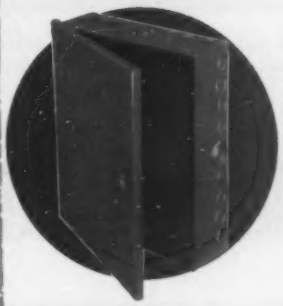
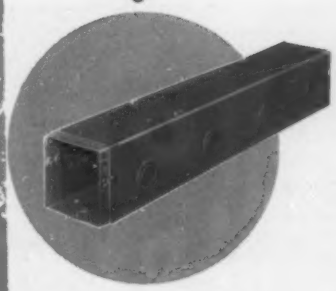
Over 100 stock sizes for immediate shipment. Hinge cover cabinets and surface and flush pull boxes in baked gray enamel or galvanized finish. Also transformer cabinets, telephone cabinets, rain tight and weather proof cabinets. Custom enclosures made for every electrical requirement.



100% LAY-IN SERVICE DUCT AND FITTINGS:

New improved designs save contractors as much as 25% installing time. Hinge Cover and Screw Cover types — with or without knockouts, in baked gray enamel or galvanized finish. Key hole slots in screw covers, oblong holes for quick attachment of connectors, combination spring swivel, positive active latches on hinge cover duct, all fittings including crosses, tees, elbows, panel adaptors and hangers.



Mr. Jobber — you will build customer good will with this High Quality Complete Wiegmann Line and simplify your purchasing to one factory for everything.

E. M. WIEGMANN & COMPANY, INC. FREEBURG, ILLINOIS

(located in metropolitan St. Louis means fast delivery everywhere)

Improved lighting has increased sales in this Kingsport, Tenn., supermarket by making displays more attractive and easier to see. Customers like the more pleasant atmosphere, the architect says.

Sales-potent lighting for a market

By J. L. Tugman

General Electric Co.
Cleveland, Ohio

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

◆ A POWER GROOVE fluorescent lighting system with filament PAR lamps has been credited as a major influence in building sales for a Kingsport, Tenn., supermarket.

The system, designed by architect Hamilton Wallace, and installed by the Kingsport Furniture and Electric Co., delivers 130 footcandles in service for the Oakwood Market.

In choosing Power Groove lamps and equipment the proprietors and their architect achieved the illumination they wanted with an initial saving over alternative systems of 25 cents a square foot. This estimate of saving has been carefully checked and is approved by independent studies.

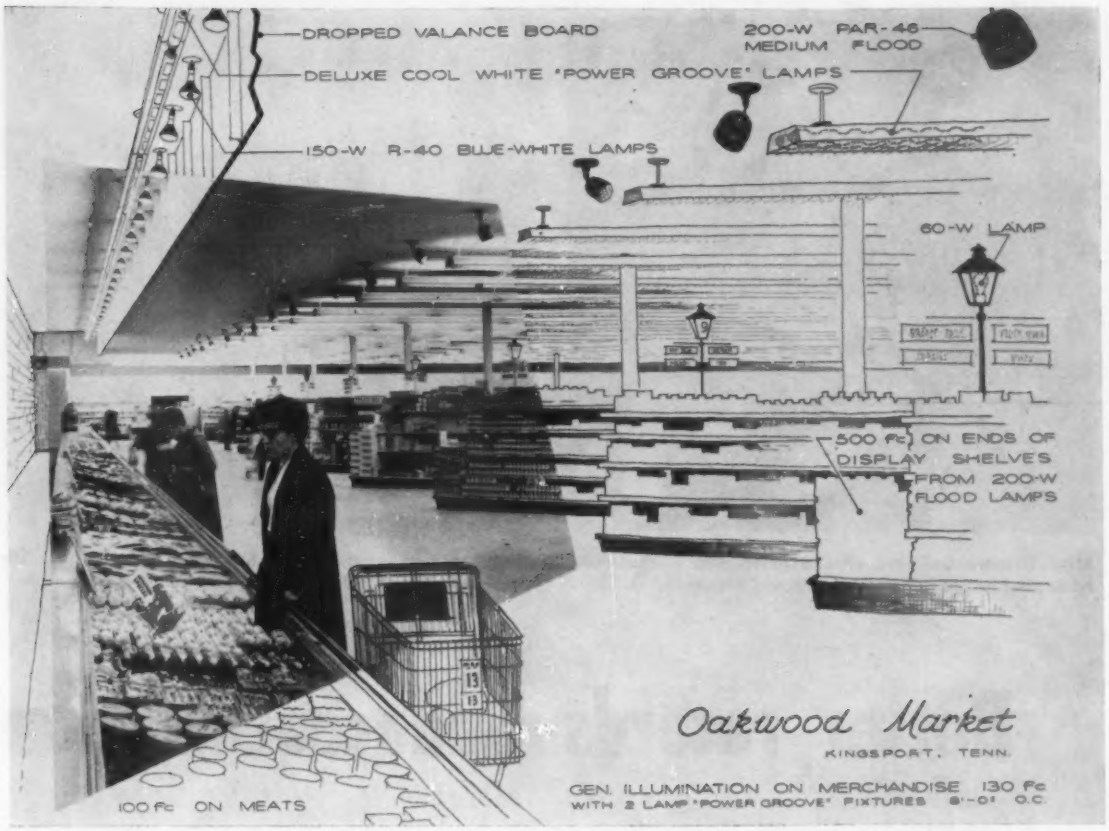
Alfred Makulec, widely-known G-E store lighting specialist, says of Oakwood Market: "The lighting is an excellent example of good results through careful design. It realizes the objectives of progressive supermarket management to provide the best possible environment for self-selection of merchandise. Lighting that provides for reduction of glare, faithful rendition of merchandise colors, and dramatic accents on key displays, is a valuable selling tool.

All-over improvement

"The profit factor of better store lighting such as this becomes evident surprisingly soon. To achieve this greater selling power, modern lighting makes every item in the store more visible and colorful. The store atmosphere is pleasantly inviting and visually comfortable. Shoppers and store personnel look better. Accent lighting adds an over-all 'sunshiny' mood."

Appropriately, with lighting well above 130 footcandles, and a moderate outdoor climate most of the year, there is adequate air conditioning. The customer finds the weather inside the store just about as ideal as the seeing conditions. Shopping can be a very welcome recreation where all circumstances encourage patrons to look around a little longer.

Heat pumps are relied on for the year-round weather control for the store. This equipment is another evidence of the progressive attitudes of the proprietors and the architect. Mr. Wallace, the architect, says: "There is always some element of surprise for an architect in the way a building


DROPPED VALANCE BOARD
200-W PAR-46 MEDIUM FLOOD
DELUXE COOL WHITE "POWER GROOVE" LAMPS
150-W R-40 BLUE-WHITE LAMPS
60-W LAMP
500 Fc ON ENDS OF DISPLAY SHELVES FROM 200-W FLOOD LAMPS
Oakwood Market
KINGSPORT, TENN.
GEN. ILLUMINATION ON MERCHANDISE 130 Fc
WITH 2 LAMP "POWER GROOVE" FIXTURES 8'-0" O.C.
100 Fc ON MEATS

This diagram shows how lighting was selected and positioned for balance and attractiveness of illumination. Note the concentration of light over the meat counter, bringing out natural food colors.

turns out in use. There was a very pleasant surprise for me in the way the Oakwood Market has worked out. It was designed to produce certain goals of the client. Among these goals were fine appearance, functional superiority, and most important—high volume, good profit business.

Consumer reaction

"All these things have been achieved, I believe, to the full satisfaction of the owners. The extra for me is the typical consumer reaction. Shoppers like to buy their groceries in Oakwood Market. It is quite likely you will hear one say: "I just love shopping here and I don't have trouble getting my husband to come along. Then we always buy more groceries.' "

Speaking for the owners and developers J. K. Tiller sums up the case for the lighting as management observes it.

(Continued on page 122)

Owners of Oakwood Market praise the economy as well as attraction, good environment, and sales power of the lighting system.

Miss Yvonne LeFevre checks price and information book that keeps quotations fast and accurate.

Logical parts arrangement, with related parts together, help coordinate an electrical business.

Better records and coordination

By Randolph W. Reed, Jr.

President
Reed Electric Co., Inc.
Washington, D. C.

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electric Utilities
Electrical Wholesalers ✓
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ ACHIEVING professional status in an industry which is becoming increasingly complex demands that an electrical contractor constantly search, study, and adopt systems for maximum efficiency that will help him grow with the times.

The means he devises to buy more efficiently, control inventory for maximum turnover with smallest capital outlay, and keep personnel informed and alert to current changes will be a telling and vital factor in his ability to compete. The costly hours spent seeking better ways of handling a procedure pay off many times in money and time savings, and in sounder customer relations.

Prior to moving into our new location with floor area double what we previously had, we had spent months reviewing our general and specific approaches to handling all aspects of our operation. To bring under one cover all data on the complex nature of our job, we compiled a price and information book that breaks down into categories for quick and accurate reference any detail an estimator, salesman, mechanic, or office worker wishes to know. Categories like credit, employees, code, pricing guides, materials, stock, etc., make information immediately available.

Under credit, for example, we include terms, rate chart, application; under employees, we have the work schedules, job description, and responsibilities of each; under price guides, we have average labor costs on the commonest types of jobs, on the installation of appliances, and on contract jobs based on cost surveys we made over the years.

For example, after checking the price book, our office manager can give an approximate estimate to a customer who calls in to learn what it will cost to put a postlight a certain number of feet from her house. On contract jobs, standards have been worked out so that we can give an accurate estimate of what it costs in labor, materials, and permit to put ½-inch steel tube at $1.20 per foot or 3-inch conduit at $7 per ft.

Under materials we have a complete current listing of every item we have in stock, a description of it, and the most desirable maximum quantity we keep on hand. (I shall refer to this again below). Under materials we also keep the general catalogs of manufacturers whose products we stock. This proves an invaluable reference at our fingertips; we have immediately available for customer information or our own whether a locknut or a wiring device is obtainable in a certain size and at what price.

Our stock sheets detail each item carried. Bulbs, for example, detail manufacturer's number, description, size and sale price, number carried in stock. The same holds for panels, surface raceways, bells, transformers, push buttons,

These bins, built specifically for size of items, are labeled with descriptions and quantities.

Good systems allow more time for customers and a little relaxation. Here Mr. Reed goes fishing.

can reduce overhead

wiring devices, etc. Our bins and shelves in the stockroom, constructed to fit size of item stocked in it, carry the same information giving a description of item, manufacturer's number, and an encircled quantity designating maximum level.

Our stockman takes a monthly inventory on the 25th of the month, and on the 26th we order for a 30-day supply. Our accounts, run from the 26th of the month to the 25th, are paid by the 10th, and we discount our bills.

Informed bidding

After the stockman prepares his list of items needed for the next 30-day supply, we get quotations from several suppliers on listed items and place our orders with the supplier giving us the best deal. We have found enormous differences in price quotations on identical items, saving as much as $50 per item in one recent instance.

By this procedure of monthly inventory ordering on the 26th, waiting one day before placing our order, we not only save hundreds of dollars but have 40 days in which to sell, collect our money, and discount our bills. It means that we can operate just as efficiently on less capital. We believe from the few months we have had the procedure in effect that we can reduce money invested in stock by 50 per cent.

Our stock sheets and monthly inventory-taking mean also that our $30,000 (cost) stock is controlled and replaced more efficiently, and that count can be taken within two hours. Knowing where we stand monthly with regard to income, outlay, and current stock levels, we know from month to month whether we have made money in the past 30 days or whether our business has lagged.

Our guide books serve an increasingly important role. In an organization of more than two or three estimators, guide books contribute toward uniform estimates. There is no discrepancy between a quotation given over the telephone and a re-quotation given four weeks later by an estimator. We have one person responsible for making all changes in our guide books so that uniformity will prevail throughout the company's five references. The guide books are indispensable in checking back on an estimate when a customer raises a question on price. When you have detailed labor, material, and permit costs that you can explain, you are working from a sounder base.

In the stockroom, layout was planned by related items. Items appearing on the same stock sheet are grouped together in bins—horizontally by size, vertically by item. No time is lost by a mechanic looking for such related items as outlet boxes, covers, BX connectors, staples, wirenuts, and BX straps. He moves from left to right to find steel tube fittings and conduit fittings. On certain items like threadless conduit couplings, we have printed on the bin an encircled zero indicating that the item is not to be reordered.

Individual encouragement

We have discovered that having all office personnel in one large area in our new building rather than in small individual offices is a stimulus to work production. We appear more eager to give a good accounting of ourselves in front of others. Also, since our jobs overlap, we frequently hear what is going on, which has proved helpful.

For example, promising a job for 8 a.m. when someone has just had information of a delay in ma-

(Continued on page 121)

Maintenance profits stabilize electrical

By Ross L. Holman

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electric Utilities ✓
Electrical Wholesalers ✓
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ MAINTENANCE JOBS may be less appealing than new wiring projects, but they are raising good returns for a Nashville, Tennessee electrical firm.

Jimmie Stansell, who masterminds the Stansell Electric Company in Nashville, has built maintenance operations into 40 per cent of his total annual volume. One advantage of maintenance work, he points out, is that it is so regular. You get a list of dependable repeat customers who just keep on repeating as long as you give them good service.

Although Stansell also does general electrical construction, the company has four service trucks, each with a skilled electrician doing nothing but maintenance service. These take care of all the electrical installations in such business houses as Harvey's, a department store fronting an entire block; the five- and ten-cent stores of Woolworth, McClellan, Grant, and Kress; as well as many restaurants and manufacturing plants.

These buildings, of course, have many kinds of electrical equipment, such as air conditioners, escalators, neon or fluorescent lighting, heaters, and other devices. The restaurants have electrical cooking and refrigeration facilities. Sometimes a heavy piece of equipment, such as a stove, can't be repaired in the business house itself. In that case it is brought to the Stansell workshop, where the trouble-shooting service man has all the essential tools to put it back in shape.

Trucks are stockrooms

Generally speaking, the service trucks, which are kept busy throughout the entire work day, carry along all the most essential parts that are likely to be needed. One of the four trucks is devoted exclusively to the repair and servicing of electric heaters, and has an assortment of almost every tool and part needed in this kind of work.

Mr. Stansell carries no written contract with his local maintenance customers and takes care of them on a call basis. He makes a verbal arrangement with each business house to meet all its electrical needs, a policy which has worked out well in practice.

Although he started Stansell Electric Company 20 years ago, he didn't take on regular maintenance until 10 years later. "I had to subsidize this phase of my operations at first," he stated, "but I kept hammering for new business and adding new facilities to take care of it as the needs arose until I got it on a paying basis."

In order to hold the confidence of his maintenance customers and keep them well enough satisfied to stay with him, he has had to invest quite a bit of capital in equipment and parts, so that each job can be completed without delay. When, for example, an important piece of restaurant cooking equipment fails at a peak catering time, or an air conditioner system quits on a hot sultry day, the business house involved can lose a lot of trade if the repair work is seriously delayed. To meet this need Stansell probably has a stock of parts as large as any trouble-shooting house in the area.

Prepared for action

Being prepared to give quick service on any maintenance need did much to build the maintenance volume to its present high level. It has brought in much business from outlying towns. In some of the other towns, the Stansell company maintains the city's traffic signals, which adds quite a bit of revenue. Servicing the electrical equipment in several out-of-town schools also adds to business volume.

Among the company's recent acquisitions in maintenance jobs are contracts with General Electric, Westinghouse, Hot Point, and other electrical manufacturers. Under these contracts, Stansell services appliances of these brands during the guaranty period of each consumer purchase.

When he decided ten years ago to build up a maintenance volume, Mr. Stansell did it with a form of saturation advertising. He used newspapers, radio, billboards, and other promotional mediums. "I wasn't in a position to do any field selling on maintenance jobs in the way of personal calls on prospects," he explained. "I was already well established in business and was well known by my potential customers, many of whom had already used my services in installation and other work. So I merely kept before them a continual reminder that I was in a good position to take the worries of their electrical facilities off their minds and assume them myself."

His promotional offers began to bear fruit, as one business house after another began maintenance relations with his company. The satisfaction of each new customer gradually spilled over on non-users until it gained enough momentum to keep four full-time service men and trucks running down the calls.

To expedite this work and give each user quicker service, Mr. Stansell is installing a two-way radio communication with each of the four maintenance trucks. In addition, he is installing it in his own car and in the vehicle of his superintendent, so regardless of where he or his superintendent is when an emergency call comes in, he can immediately contact the service truck nearest the place of distress. Mr. Stansell estimates that this two-way communication will pay for itself in five years.

Variety of services

While outside maintenance work keeps four full time electricians busy, he also has enough inside repair work on home appliances to keep four other skilled operators busy. These latter four men devote their entire time to the servicing and repairing of appliances brought in mainly by residential users. This form of maintenance

work has been built up much the same as that on the outside, since Stansell Electric Company does not sell any electric appliances.

Each of the four inside workers is a trained specialist in one of the four phases of repair jobs that are divided between the four men. One of the home maintenance men works on radios and record players. The second has irons, electric shavers, and mixers; the third man, percolators, toasters, and waffle irons. The fourth one devotes his time to the repair of heaters, hand tools, and vacuum cleaners.

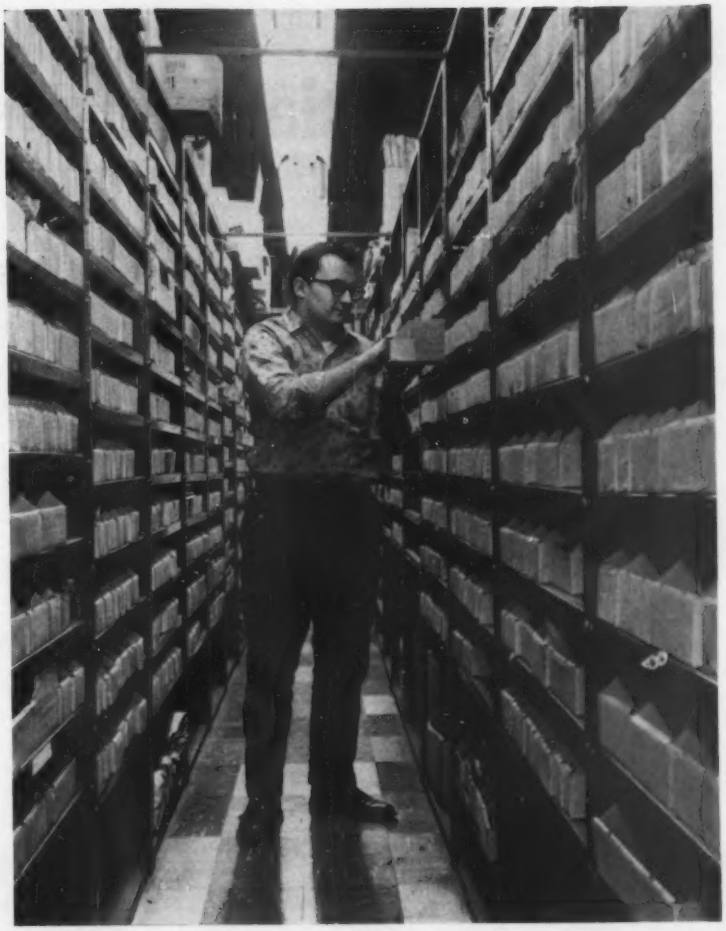
This fourth operator has an interesting set-up. His work bench sits right at the end of a conveyor track which brings the appliances to him as needed. When a heater, electric drill or vacuum cleaner is brought to the shop for repair, it is suspended by a special hanger to the conveyor track and started on its way to the work bench at the other end. Usually this conveyor track is loaded with such appliances waiting to be repaired. The man at the bench takes each one off in order and restores its usefulness.

Organization of work

The other three indoor appliance repairmen have special shelves on which to store the machines awaiting service, and other shelves on which to place those ready to go out. Mr. Stansell doesn't provide any pickup or delivery service on these inside repair jobs.

In order to meet the needs of both his outside and inside maintenance jobs, Mr. Stansell keeps a stock of over 50,000 parts items on hand. These involve several brands of machines and equipment, such as General Eelectric, Westinghouse, Hot Point, and others. Parts are stacked in rows of bins reaching to the ceiling and occupying a large area of the Stansell plant. A special section is used for the larger and bulkier parts.

Stansell has a close control system on the parts, using a card index showing, among other things, items that are getting low in stock and items that have become obsolete.



Well arranged bins hold some 50,000 parts used in maintenance work.

Jimmy Stansell, company owner, gives detailed instructions to one of his maintenance men, about to drive off to a trouble-shooting job.

Texas-Louisiana inspectors meet

◆ EACH YEAR five Southwestern chapters of the International Association of Electrical Inspectors hold a joint annual meeting. The chapters, designated as the Baton Rouge, George Welman, No. Louisiana-East Texas, Texas, and Texas Gulf chapters, met this year in Marshall, Texas, with Mr. and Mrs. Ben Davis in charge of meeting arrangements.

As is customary at these meetings, most of the business session time was devoted to questions and answers on the National Electrical Code. A panel of Code experts, headed by Frank Camus, Shreveport electrical contractor as moderator, included Stayton Thomas, chief electrical inspector of Shreveport; Curtis Kennedy, president of the Southern Section, IAEI, of Greensboro, N. C.; Kent P. Stiner, Bulldog Electric Co., Detroit; Merwin M. Brandon, president, Underwriters Laboratories, Inc., Chicago; George Flach, chief electrical inspector of New Orleans, La.; Eustace Soares, Pringle Electric Switch Co., Jersey City, N. J.; and M. D. Darrah, chief electrical inspector, Dallas, Texas.

At the concluding session, the group voted to hold the 1961 meeting in Abilene, Texas, at the Windsor Hotel, on April 28 and 29, with Warren Swafford as general chairman of the arrangements committee.

How the panel answered

Following is a brief summary of questions asked and answered during the Code discussion periods.

(1) Sec. 210-22 (b) Receptacle outlets required in dwelling type occupancies. Most dwellings that are being built now do not have a dining room or a breakfast room, but a room that is called a family room that also takes in the kitchen without any partition. Can the receptacles in this room be put on the 20-ampere branch circuit required by Section 220-3 (b)?

Answer: Yes, if in the opinion of the enforcing authority the kitchen area is not large enough for a dining table and/or family room can be used for an eating area. (There was not full agreement of all those present.)

(2) Sec. 210-22 Receptacle outlets required. The second paragraph of (b) in this section states: Where an outlet is installed in the kitchen at the sink location this outlet shall be of the grounding type. Is it the intent of the code to require a grounding type receptacle to be installed where an appliance can be plugged in and set on the sink where the appliance can be reached from the faucet?

Answer: No. Required in 210-22-B for portable laundry and dishwasher.

(3) Article 500 Group (F) atmospheres containing carbon black, coal or coke dust. This is in reference to a large printing room. The ink they use has carbon black in it and when the press is in operation there is a heavy ink mist in the room. There is to be some filters installed in the room to take care of this mist. Would the wiring method listed under Group F of Article 500 be required for this type of room?

Answer: No.

Fixture mounting

(4) A. Sec. 410-74b — Fixture mounting. Would a fixture containing a ballast mounted on gypsum wall board (Sheet Rock) be a violation of Sec. 410-74?

Answer: No. (U. L. now lists fixtures for direct mounting).

B. Sec. 346-6 Number of conductors in one conduit Table 1, 2, 5 and 8 of Chapter 9. In figuring the approximate area in square inches of conductors for insulated conductors in Table 5, can you figure bare conductors in approximate area in square inches in Table 8 for services, or should they all be figured as insulated conductors?

Answer: Not allowed by code. (Last sentence at the end of fine print note following Table 5 says that dimensions in last column may be used for wiring existing raceways and makes no reference to Table 8).

(5) A Sec. 300-23 Temporary wiring. Should 300-15 boxes be considered on temporary wiring?

Answer: No.

(B) Also would Sec. 250-59 be used?

Answer: No.

(C) For this type wiring would a weather proof socket with a 30-ampere fuse ahead of an outlet with friction tape wrapped around the terminals be permitted?

Answer: No.

(D) Wiring described when used for shows or carnivals on the ground within reach.

Answer: Yes.

(It was the opinion of the group that more rules are needed concerning temporary wiring.)

(6) Article 410-53—Receptacles in floors. In a residence where a floor plug (receptacle) is required would a standard outlet box be approved?

Answer: A. If hardwood floor or carpet—Yes. B. If wood floor and other types likely to be mopped with water—No.

(7) Subject: 277-Volt Incandescent Lighting. This lighting is allowed in mines, etc., by N.E.C. Sec. 90-2(b). Otherwise, it is forbidden under 210-6 (a) and is not included under Sec. 210-6. Exception No. 1 because 277 volt lamps are provided only with medium bases. The expressed hazard of exploding lamps is still in existence as there are medium base incandescent lamps rated for 6 volt and 12 volts.

Answer: Mines are not covered by N.E. code. Code making panel did not intend recognition of over 300 volts to ground. Mr. Brandon of U.L. said 300 volt medium base lamps available, 600 volt medium base not listed by U.L., all of those present were in favor of requesting non-interchangibility of medium base lamp holders.

(8) What wiring method is approved for locations where automobile tires have the tread buffed off for retreading? If this location is ruled hazardous, why do these machines come from the factory with the large drive-motor listed for use in Class II Group G locations and the smaller drive-motor, which is an integral part of the equipment, of the open type controlled by an ordinary reversing switch?

Answer: 502-4 applies to wiring—reversing switch should be listed for Class II Group G.

(9) Article 230-70 Paragraph (g). Disconnect means—6 or less operations of the hand. Would a Federal 108-16 panel with 1 NA-240 breaker, 1 NA-230 breaker, 8 NC-020 breaker, meet the requirement within the intent and purpose of the code?

Answer: No. (More than 6 overcurrent devices per phase).

(10) Just how adequate is the 3 watts per square foot basis for general lighting in a residence? (Table 220-2 (a). Would there be any justification for using Article 220-2 (b) in lieu of Table 220-2 (a) for general lighting requirements?

Answer: No. 220-2(a) is adequate.

(11) Is the motor on the central heat unit, which is of the order of ¼ to ½ hp with internal thermal overload, considered adequately protected by the circuit overcurrent protection?

Answer: Yes, if 15-ampere circuit; no, if over 15-ampere circuit.

(12) Is it permissible to use the residential type circuit breaker such as Federal NA, Square D, QO, Cutler Hammer XO series, Zinsco, Walker, etc. as circuit protection of single-phase and three-phase 230-volt motors? I have in mind the residential mechanical refrigeration units of 3, 5, 7½ tons rating.

Answer: No. (Circuit breakers not recognized for group overcurrent protection. 430-53-84 fuses only.)

(13) Is the service panel in a room or closet which is kept locked and thus accessable only to the occupant, in violation of Article 230-70 (b) as regards readily accessable location?

Answer: No.

(14) Article 346-3. Is a sand or dirt fill under a non-cinder concrete slab considered a wet location?

Answer: Yes.

(15) Just what is intended to meet the requirements of non-interchangeability of certain circuit breakers? (July 1, 1960 Requirements)

Answer: Effective date delayed by inspectors.

(16) What distance from the sink is considered as being at the sink location, thus requiring a grounding type receptacle? (Are manufacturers going to be required to put grounding type attachment caps on small kitchen appliances?)

Answer: Grounding type receptacle is required for portable laundry and dishwasher. Maximum distance 6 feet according to Mr. Stiner.

(17) Is it considered to be unsafe to be able to touch laundry equipment and service entrance equipment simultaneously when both are properly grounded?

Answer: No.

(18) Is it permissible to use greenfield with TW or RHRW wire where subject to weather?

Answer: Yes.

(19) Table 210-25—Would this table permit tapping from a 20-ampere circuit to a light outlet with No. 14 wire as long as the demand does not exceed the rating of No. 14?

Answer: No. If not more than 18 inches to outlet or more than 6 feet on recessed fixtures.

(20) Do bathroom ceiling fixtures on sheetrock ceilings and bathroom wall switches on sheetrock walls need to be grounded? (Article 410-93 Exception No. 2)

Answer: No. If not within 8 feet vertically or 5 feet horizontally.

(21) 210-7-210-22 A non-metallic sheathed cable branch circuit is installed to supply a fixture containing a grounding type receptacle. Would 210-7 apply or would a separate grounding conductor to a nearby electrode be in accordance with the N.E.C.

Answer: 210-7 applies.

(22) Reading from 210-7: "The branch circuit or branch circuit raceway shall include or provide a grounding conductor to which the grounding contacts of the grounding receptacle shall be connected."

A. When the wiring method is a metallic raceway, is it the intent to require a bonding bushing and a bonding jumper to connect the raceway to the grounding contacts on the grounding receptacle?

Answer: No. Bone method approved.

B. Would the metal strip in armored cable, if connected to the contacts of the grounding receptacle, be satisfactory?

Answer: Yes.

(23) Where should the equipment grounding conductor be terminated in a sub-panel when the circuit is installed in accordance to the requirements of 210-7?

Answer: To the service ground.

(24) If a separate block was installed in this sub-panel, would the U. L. label be void?

Answer: No.

(25) Should U. L. approve or list a block for this purpose in their standards?

Answer: Yes. (But this is a recommendation)

(26) Is it the intent of Sec. 240-25 G3 to prohibit the installation of *spare breakers* of higher ratings than 20 amperes which are left for future additions?

Answer: No. It seems that the wording of this section would only apply to spare spaces. Not spare breakers.

(27) Section 210-7 Assuming under this section you are starting at the service panel with conduit or tube, then how will you connect the

Members of the discussion panel for the five chapter meeting of IAEI, held in Marshall, Texas, left to right, are Stayton Thomas, chief electrical inspector, Shreveport, La.; Curtis Kennedy, president, Southern Section, IAEI, Greensboro, N. C.; Kent P. Stiner, coordinator, Bulldog Electric Co., Detroit, Mich.; Merwin Brandon, president, Underwriter's Laboratories, Chicago, Ill.; Frank Camus, panel moderator and member of the electrical codes committee of NECA, Shreveport, La.; George Flach, chief electrical inspector, New Orleans, La.; Eustace Soares, Pringle Electric Switch Co., Jersey City, N. J., and M. D. Darrah, chief electrical inspector, Dallas, Tex.

branch circuit raceway to the grounding contacts on the grounding receptacle? Would the bonding strip in the box be suitable if it was continued to the grounding contacts on the grounding receptacle?

Answer: Yes (Bone method OK.)

(28) In view of the non-interchangeable circuit breaker requirement of Code Section 240-25 (G), will the generally acknowledged difficulties in making the so called "thin" breakers non-interchangeable prohibit their future use?

Answer: No. For replacement and also new work.

(29) Does the code require separate overcurrent protection and disconnecting means for built-in ovens and counter mounted cooking units?

Answer: No.

(30) Can Type S. E. Style U service entrance cable be used for wiring to electric ranges since it is rated at 300 volts?

Answer: Yes.

Grounding receptacle

(31) With a non-metallic wiring system, when a grounding receptacle is installed, is it permissible to ground the receptacle with a separate grounding conductor?

Answer: No.

For example—bare grounding conductor installed separately and attached to cold water pipe with proper ground clamp?

Answer: No.

If so is Section 210-7 correct?

Answer: Yes. (One panel member disagreed.)

(32) Can aluminum conduit be used underground?

Answer: Rule Article 346 the same as for Rigid Conduit.

Committee Note: Discuss thin-wall and rigid.

Answer: Soil should be checked and analyzed.

(33) Is it permissible for a washing machine outlet to be one of the two circuits required for kitchen, dining, laundry, etc.?

Answer: Yes if not a fixed appliance.

(34) Is it permissible to secure the bare neutral to the galvanized eye-bolt without an insulator? In other words, is this fitting approved for the purpose? Sec. 230-27.

(Editors Note: Questioner submitted a drawing showing a 3-conductor service drop cable with a bare neutral hitting a galvanized eye-bolt on a masonry wall and service equipment with a weather head connecting to the 3-conductor service drop.)

Answer: No, if done by contractor. N.E.C. does not apply to utility company installation.

(35) What is the status of non-interchangeable breakers and U.L. Will N. I. Breakers be available to the contractor on July 1? Is the July 1 date in the code going to be set back to September 1 or January 1?

Answer: Same, answer as to Question 15; this has been delayed.

(36) Reference 240-15C exception 5. Is it the intent of the code that taps up to 10 feet be used in general purpose wiring such as residence, office building or plant or is it for use only on switchboards or control devices as stated?

Answer: Yes. If it conforms to exception # 5 Note 3.

(37) Considerable difficulty has been experienced when inserting two wire caps into receptacle # 1 whereby the blades are adjacent to the grounding screw in the center and frequently they ground or short when the insulating fibre disc is not in place and a new type is suggested with all blades to the outside away from the grounding screw.

No comment from panel on this.

(38) This was in reference to seals between service station building and pump island and service station and light standard being feed thru pump island. Is additional seal required at service station building and at light standard?

Answer: yes.

(39) Sample of receptacle that inspectors have had fail was submitted to Mr. Brandon of U. L., the trouble is the inner parts are pushed out of the receptacle body.

(40) How will the inspector be able to identify the non-interchangeable type of device as well as the breaker. Will the old type breaker of 15 and 20 ampere size (without the new label) be allowed in the new devices?

Answer: Will be labeled non-interchangeable.

(41) Will code allow two services on a duplex using 2 Q.O.M. 12 circuit panels set on wall back to back connected by 1¼ nipple, using one 2" service conduit through the roof with 6 # 2 R.H.W. wires? (3 # 2 for each panel are run without splice). The meter is on the pole and all services from same transformer. Wires run overhead from pole to house?

Answer: Ok in accordance with code.

(42) Does THW have the same characteristics as RHW?

Answer: yes.

Where the specification is for RHW, can you substitute THW?

Answer: Legal question, between purchaser and person selling wire.

(43) Would a concrete floor covered with carpet from wall to wall be considered as an insulated floor?

Answer: Yes by some inspectors and no by other inspectors.

(44) Section 230-71 (a) except #1 rating of service equipment. What determines the figure of 10 kw in the above rule? (There seems to be more margin for future load growth here than with the 60 ampere disconnecting means.)

Answer: 10 kw just used as a starting figure.

(45) With the advent of grounding receptacles in residential work, Romex with a bare # 16 ground wire is used for this purpose. It seems that this is a weak link for effective grounding. How about some comments.

Answer: There has been no trouble reported of broken or damaged ground wire.

(46) Article 210-6 Reference is made to a standard receptacle. Just what is a standard receptacle?

Answer: Do not know.

(47) Article 210-6 Exception 2 In industrial plants with Hi-Bay Mercury Vapor lights, the best installation is a balanced three phase system from the point of view of flicker, wire size, etc. Why does the code restrict this to voltage not to exceed 300 volts to ground?

Answer: There are many installations installed now and seem to be giving no trouble. (The meeting recommends consideration be given for code recognition.)

(48) Article 410-76. 1. Does this mean the starting condition or actual operating conditions?

Answer: Operating conditions.

2. Does the supply voltage have to be grounded if the operating voltage of the lamp is 280 volts?

Answer: No - Reference is made to mercury vapor lamps.

(49) Can you splice in a condulet?

Answer: Yes. (Samples were submitted such as LBH etc which are suitable for splices.

(50) Does Article 354-6 and 7 require that two conductors be run from the main junction box to each outlet box?

Answer: No. (This had to do with 354-7 circuit supplying more than one receptacle, conductors not spliced or taped, skinned conductor, receptacle removed and circuit supplies additional receptacle.)

(51) 1. Is it permissible to install a receptacle in the ceiling?

Answer: Yes.

2. If so, should it not be of the twistlock type?

Answer: No.

(52) Should lamps and equipment in operating rooms in hospitals with a grounded floor also have three wire type cords?

Answer: Yes.

Bare conductor neutrals

(53) Is it permissible to use a bare conductor for neutral and equipment ground for metal street lighting poles?

Answer: 1. For contractor - No. 2. For utility company - Yes.

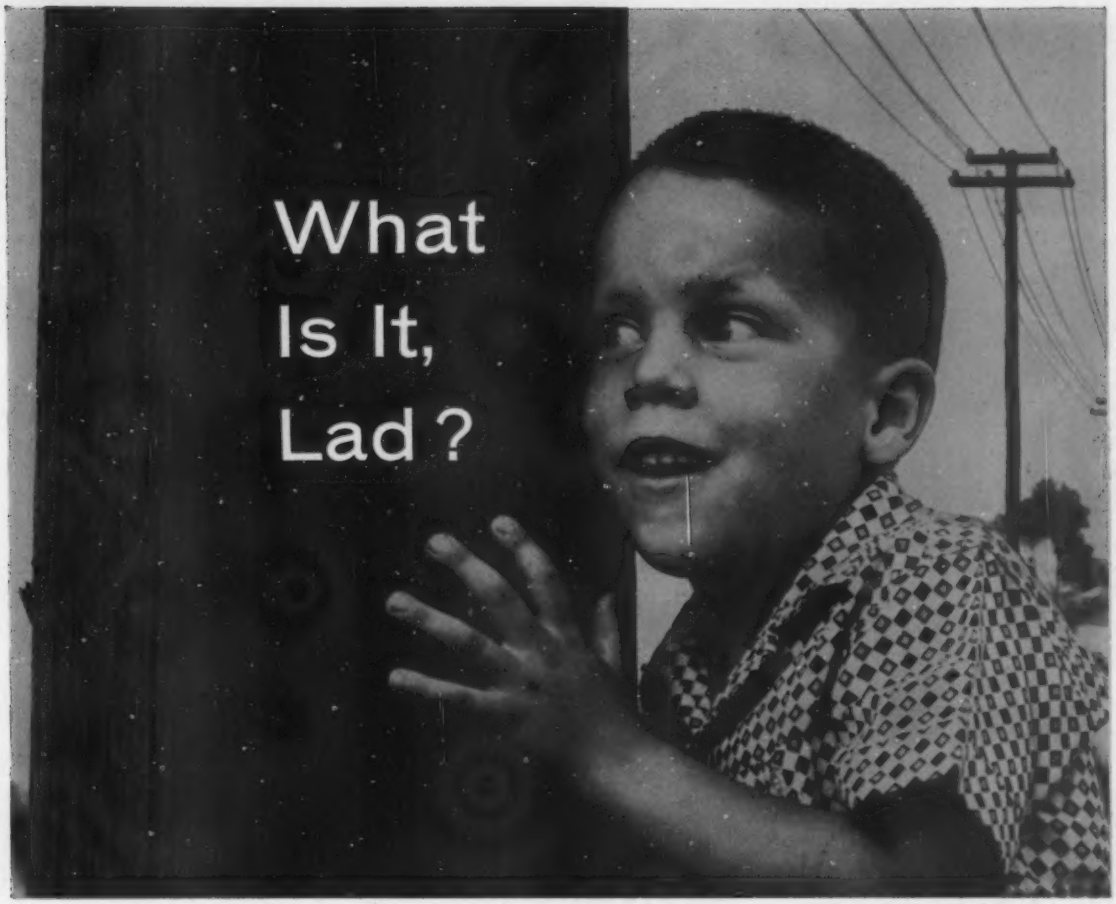
(54) It was mentioned that grounding was required inside the home only for two specific appliances at the sink location. Please discuss this requirement. Is it the location only or the type of appliance used that is considered hazardous?

Answer: Yes - Required for dishwasher and laundry.

(55) 1. Are small appliance circuits intended to be installed for the group of rooms listed in 220-3(b) or a circuit for each room?

Answer: No.

(Continued on page 121)



Westwinds Blowing Through Southwire

Every inquisitive boy has had his curiosity aroused by the hum of wind through wire. Today throughout the nation—west, north, east and south—when a boy places his ear to a utility pole, chances are he'll hear wind blowing through Southwire. Mile after mile of Southwire spans the nation—in high voltage electrical transmission lines, primary and secondary electrical distribution systems and telephone systems. Southwire began as a regional manufacturer just ten years ago. Today we have customers in 44 states and many foreign countries. Thanks to you and our other customers, Southwire has enjoyed a steady growth. We will strive to continue to merit your confidence in the years ahead.

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- Telephone Cable
- Machine Tool Wire

- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Southwire Company

SOUTHWIRE serves the world

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Studding, erected out from the wall, provides good storage bins for wire. Cartons stack so that size and type labels are plainly visible.

Callaghan Electric has both the supplies and the system to speed up jobs. Here, materials are being checked out by the company's stockman.

Material handling method lowers costs

By C. Thomas

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ MURRAY CALLAGHAN, of Callaghan Electric Co., 1530 East Missouri St., El Paso, Texas, has learned from experience: "If you can't see it, you might as well not have it."

Mr. Callaghan was referring to stocking an inventory of materials for his job superintendents and journeymen to draw on, rather than helping on local supply houses for them. While it is pretty well agreed that an on-the-premise inventory has certain advantages, these advantages can easily be cancelled out unless there is a workable system employed.

"Our inventory of materials runs between $20,000 and $25,000, and is under the supervision of our shop boy, Paul Del Rio, and our shop foreman, Freddie Huttanus," Mr. Callaghan explained.

The placement and arrangement of materials follows pretty much the same layout found in the majority of modern supply houses; that is, items are departmentalized. One section is devoted to plates and switches, another to various type fittings, another to switch boxes, and so on.

Space division by need

While the materials are housed in four separate buildings, forming an inclosed patio where the trucks are kept, there is one building that functions as a receiving area. It is also where all materials are assigned out. This building, 120-feet x 16-feet, has shelves and bins lining the walls. Two of the other four buildings function more as warehouses for materials bought in quantity, and for wire and cable. An open front shed provides storage for the various sizes and lengths of conduit. All are immediately accessible and visible.

The regular crew of 20 journeymen and helpers start checking in around 4:30 p.m. At this time, their next day's jobs are assigned. Invariably, these jobs were telephoned in by the customers. However, the person accepting the phone call probed for sufficient information so that the materials needed could be pretty accurately estimated. A material list accompanies each work order and is sent to the shop boy to be filled.

Journeymen carry no general inventory of materials on their trucks. Several trouble shooting kits are kept on hand, but these are assigned, as needed.

"Trying to stock 12 service trucks, and maintain inventory control," said the shop foreman, "would involve more time than it would be worth, both in the stock room and the office."

As the shop boy fills each order, he places the material in a carton. When the order is complete, he places it in the journeyman's truck, with a check list of the materials and the work order.

Price service for charges

The stock boy does no pricing out. This is performed in the office after the job tickets are turned in. Material prices are computed from a price book service. Price changes come in as often as price changes occur. The mark-up on materials is already figured

(Continued on page 120)

ANNOUNCEMENT:

KRALOY

RIDGID PVC CONDUIT

AND ELECTRICAL FITTINGS

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RAYBRO DISTRIBUTORS

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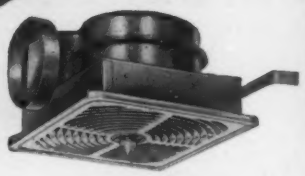
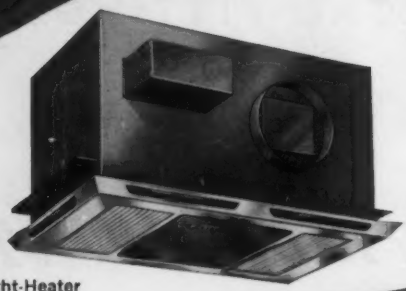
** FOR DIRECT UNDERGROUND BURIAL OR ENCASED IN CONCRETE*

FASCO

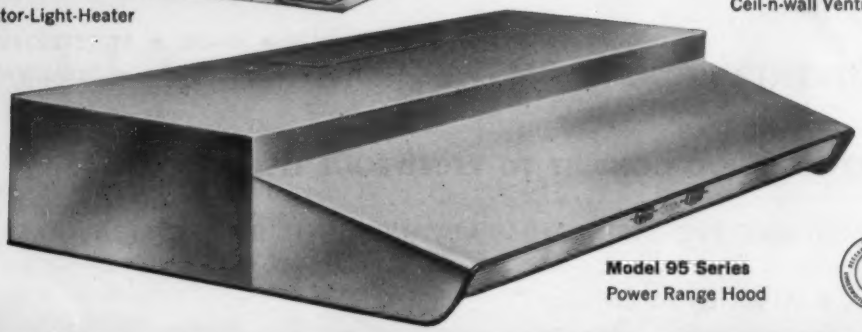


Model 650A
Bathroom Ventilator

Model 1020A
Ceil-n-wall Ventilator



Model 657C
Ventilator-Light-Heater



Model 95 Series
Power Range Hood

OFFERS "BALANCED"

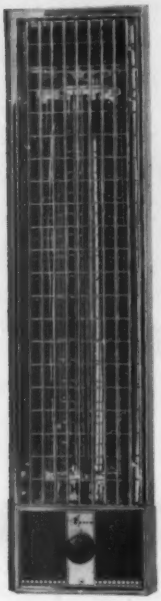
Fasco's long experience in dealing with scientific movement of air proved invaluable in developing the new electric home heating line . . . enabled Fasco to offer an efficient, pre-determined "balance" between proper heating and ventilation.

Homes equipped with the "balanced" Fasco system are free from "over" or "under" ventilating or heating . . . offer highly efficient and truly scientific control of air freshness and warmth.

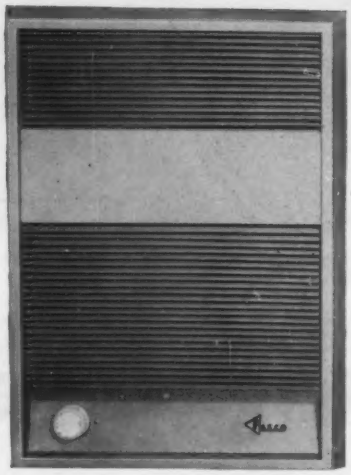
Add to Fasco's "balance" the ease of installation and the progressive styling, and you come up with the conclusion that here is heating and ventilating that makes real sense—to builders, contractors, and home-buyers alike! So look into the stability and performance of Fasco's "one-source" system for your installations.

Fasco... first with the finest Always!

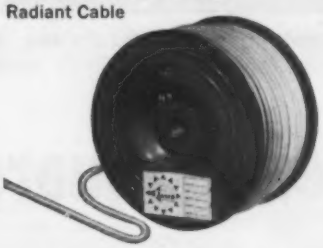
Model RW—1215
Radiant Wall Heater

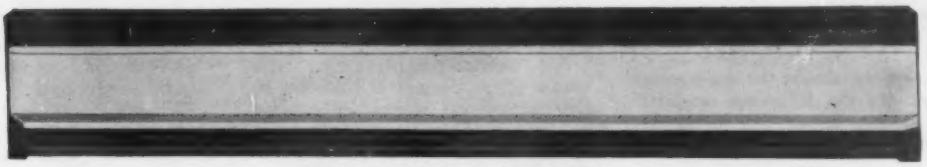


Model FW—2440
Forced Air Wall Heater



Models 2250 thru 2265
Radiant Cable





Model BB—2408 Baseboard Heat

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ATTENTION! CONTRACTORS— Fasco's "researched" ventilating and heating units are trouble-free, easy to install.

BUILDERS — Fasco heat and ventilation units offer futuristic features requested by thousands of convenience-minded builders.

DISTRIBUTORS — Fasco is a progressively-styled, highly-saleable line for modern electric home heating and ventilation.

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ES-7-60

A completely coordinated lighting system is one of the features of this $12 million dollar shopping center.

Penn Square's coordinated lighting

By W. U. McCoy

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ OKLAHOMA'S most ambitious shopping center—54 acres with seven large buildings set around a mall, and made up of 46 different stores and shops, with parking space for 4,200 cars—was recently opened with much fanfare.

To the state's electrical contractors and engineers the project is of special interest because of its fully coordinated lighting system.

The $12 million Penn Square shopping center, at a central location in one of Oklahoma City's better residential areas, was conceived and built as a unified package, and some of the best electrical thinking has gone into the project. The unified lighting method was proposed by Roy Thompson, of Carnahan & Thompson, electrical and mechanical engineering consultants for the project. Work was carried out by Oklahoma Electrical Supply Co.

All outside lighting for the whole large project is handled in five automatic stages. A canopy lighting plan is used around all buildings, using fluorescent, four-tube fixtures. At closing time, two of the tubes in each fixture go out, the other two stay on all night.

Automatic light control

Outside lights come on simultaneously at dusk; outside decorative lighting darkens when closing time nears; then canopy lighting goes to half intensity. Automatic controls also handle mercury-vapor parking area lights and turn off all outside lights at daybreak.

Telephone lines were leased for connection between buildings; telephone type relays are used for control of various islands of lights. A time clock, located in the maintenance building on the northeast corner of the project, initiates the signal, then the phone circuit carries the impulse to the control contact for the lighting circuits. This system has achieved both coordination and economy.

With 1.5 million feet of wire involved in the lighting system, need was great for the most practical controls plan. E. Griffy, Jr., vice-president of Oklahoma Electrical Supply, said the control idea used cost less than it would have by any other method.

Griffy's firm and consultants Carnahan and Thompson worked very closely together on the big project, which from ground-breaking to opening, required 15 months.

Oklahoma Electrical handled the wiring for the whole project, for both tenants and landlord. The landlord has the responsibility for the outside lighting, while the 46 tenants were free to use whatever type of inside lighting they desired, which included almost every type of fixture conceivable, with installations tailored to suit individual requirements and preferences.

Power-wise, a transformer vault is contained in each of the large buildings, with a central meter room in each building. All tenants of each building are served by feeders from the central location of both transformers and meters.

This central system for each building and its various tenants applies to gas metering as well.

Power specifications

Oklahoma Gas & Electric Company supplies 12,800 dual feed

NEW BULLDOG XL BUSTRIBUTION DUCT

CUTS INSTALLATION TIME 3 WAYS

You can install XL BUStribution® Duct easier, faster than any other duct because of these exclusive new design features . . . plated aluminum bus bars with KEYED ENDS slip together fast, align automatically for proper position. There's no fumbling and fitting . . . ONE INTEGRAL BOLT tightens fast, locks joint positively under a ton of pressure. Bolt tightens against bus bar, not against the casing . . . TEN-FOOT SPANS take fewer hangers and less time to install than ordinary duct.

New XL BUStribution Duct is 3 ways safer, too. It's the only true dead-front duct, the only one with exclusive Safety Door, the only one with Safety Plug. And it reduces duct weight on building structure as much as 40%. Ask your BullDog distributor to arrange for a demonstration . . . you'll see how fast to install and how safe new XL BUStribution Duct really is.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

SINGLE INTEGRAL BOLT puts a ton of pressure on keyed bus ends. Joints lock tight *fast*, stay locked.

TEN-FOOT SPANS take fewer hangers and less time to install than ordinary duct.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

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Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
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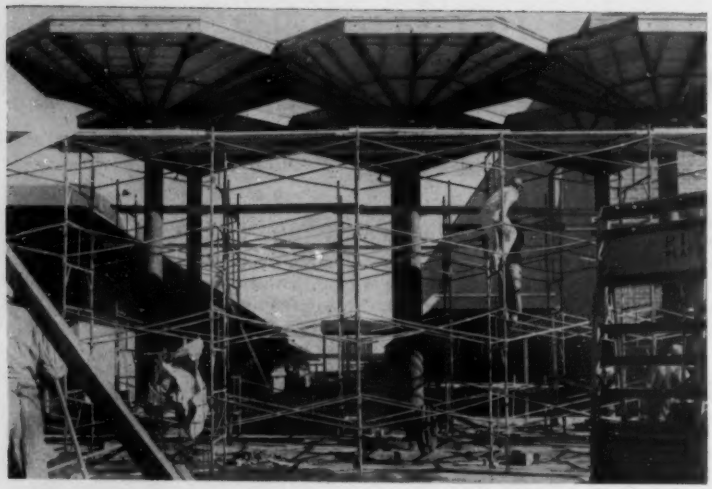
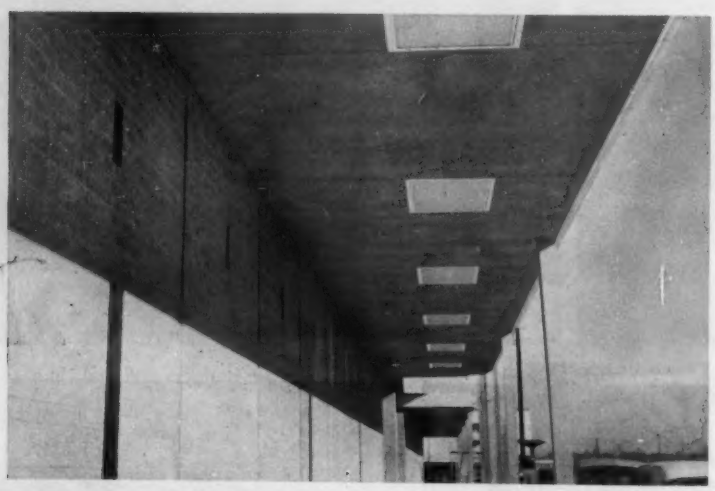
Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

Parking area lights are under automatic five-stage sequence control.



Four lamp outlets are located directly under each inverted umbrella.



Lighted canopy extends around all buildings of the center. Automatic control turns them on at dusk; dims to half brightness at closing time; turns them all off at dawn. These are four-tube fixtures.

voltage underground. Distribution voltage is three-phase, four-wire, 268/465Y. Dry type transformers supply the necessary 120 volt light and receptacle power. Estimated maximum demand for the project is 7,000 kva from the six transformer vaults.

Manhattan Construction Company handled the over-all center project; mechanical contractor was Landers-Manoy; John Rooney is developer of the center.

Largest "center" in state

It is the largest package-built center in Oklahoma—the business area contains 585,000 square feet of floor space. Gilbert Rosenthal, manager for Penn Square, said the new center is creating between 1,500 and 1,800 new jobs, and that the figure will more likely be nearer 1,800 after a short time.

Two of the largest downtown department stores are putting major investments in this center. The new John A. Brown Company store is hiring 250 to 300 persons, and Rothschild's is expected to staff its store in the center with about 90.

The S. S. Kresge Co., putting in its first Oklahoma store in the new center, is hiring close to 100 for its variety store operation. One of the largest supermarkets in the Southwest is included with Humpty Dumpty's 30,000 square foot store, and this operation will account for another 70 employes.

Unified design achieved

An "island of downtown" in the suburbs with its massive, multi-story buildings, the center nevertheless achieves a unity and design appeal that is seldom found downtown. And its broad stretches of ample parking space, plus the pleasant mall will contribute to the customer flow.

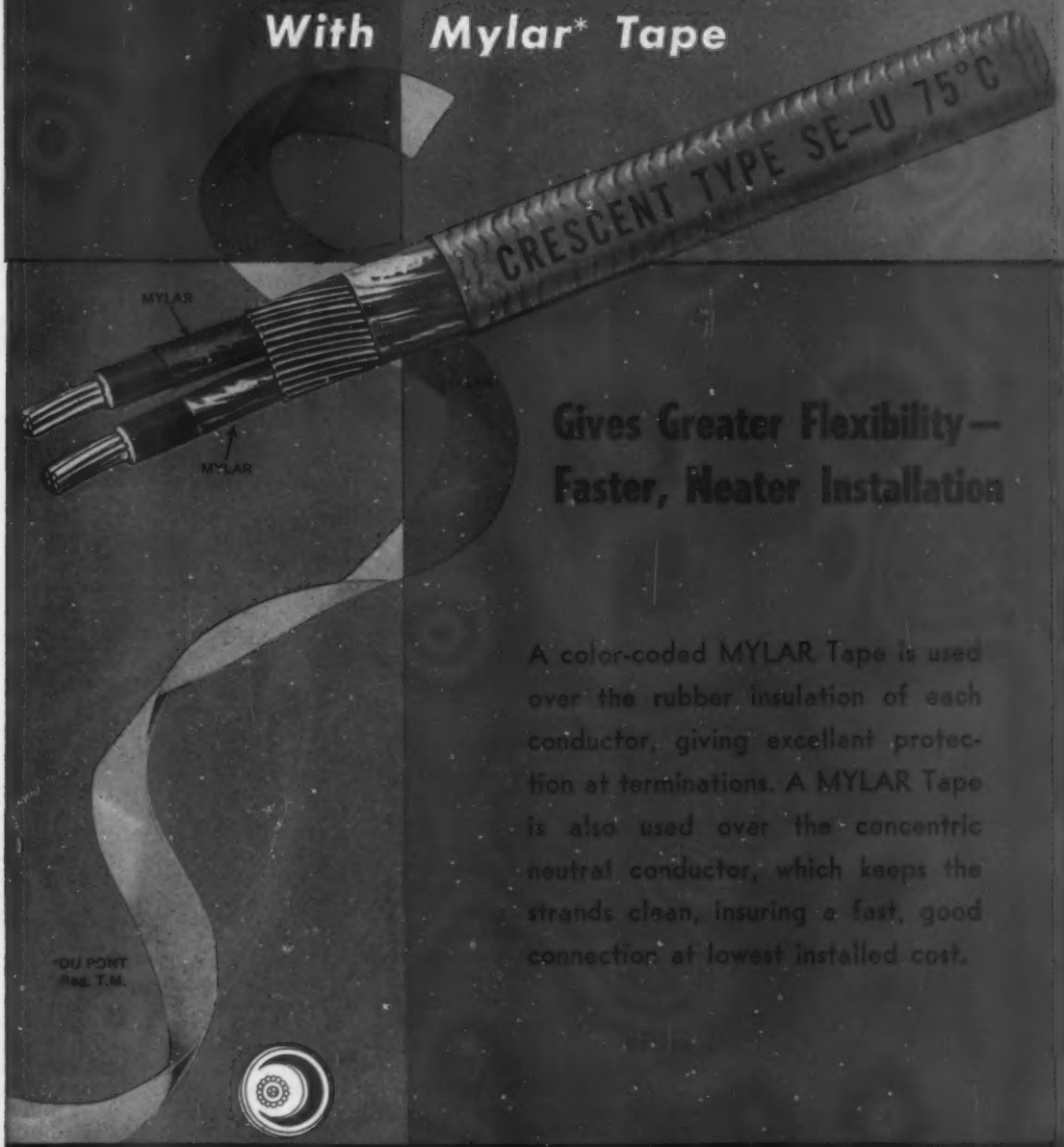
As these thousands of customers observe the best in lighting at every turn, it is only reasonable to assume that each homeowner or businessman will become aware of a broader range of lighting possibilities for his own use.

This dramatic new center, with its many "firsts" on the Oklahoma business scene, was designed by the architectural firm of Sorey, Hill and Sorey.

CRESCENT

SERVICE ENTRANCE CABLE

With Mylar* Tape



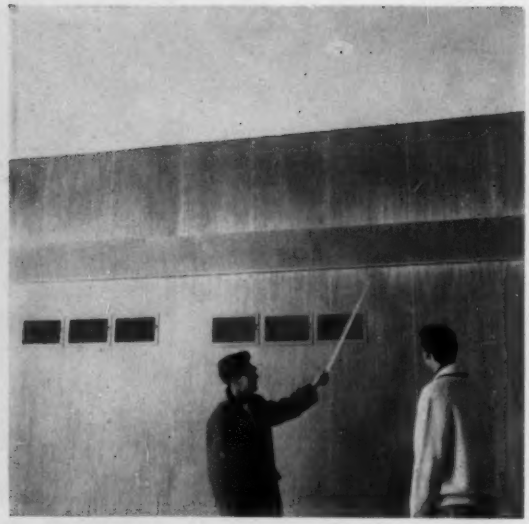
Gives Greater Flexibility— Faster, Neater Installation

A color-coded MYLAR Tape is used over the rubber insulation of each conductor, giving excellent protection at terminations. A MYLAR Tape is also used over the concentric neutral conductor, which keeps the strands clean, insuring a fast, good connection at lowest installed cost.

CRESCENT INSULATED WIRE & CABLE CO., INC.

OVER 75 YEARS EXPERIENCE

TRENTON, NEW JERSEY



Cove lighting is used in the walls of this living room, with pinpoint lighting in the ceiling.

Recessed and pinpoint lighting in the recreation room give both general and local illumination.

Auxiliary panel is in the basement.

Dimmers create dining atmosphere

Special wiring problems on a custom built home

By Archie Applegate
A. A. Electric Co.
Wheaton, Md.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers

◆ IN THE PROJECT HOUSE, where every home is identical and carried out to the letter in accordance with plans, we quote a flat cost-estimate figure for wiring jobs, but in the custom-built home where many changes are likely to occur, I prefer working on a time and materials basis.

In a recently wired custom-built house of contemporary design with cathedral type of ceiling, the builder, the contractor, the homeowner, and the interior decorator worked closely together, yet changes were continually taking place. To preclude time and labor loss when changes were suggested, I checked on the job daily and kept in touch with the builder and the architect.

Responsible for the light and power, A. A. Electric installed a 400 ampere main service of the circuit breaker type, with an auxiliary lighting panel in the basement serving the recreation room and rear of the house. There are circuits for auxiliary heating in the bathroom and special feeders for two air conditioners. The main panel controls the entire level.

A home of this type, with large areas of glass is more difficult and takes longer to wire than the conventional type residence. Each joist of the house has to be drilled for pulling wires through.

The living room of this particular house includes both cove lighting and pinpoint lighting, a combination of direct and indirect. Pinpoint lighting highspots individual pieces of furniture, such as a painting or piano, or illuminates

(Continued on page 120)

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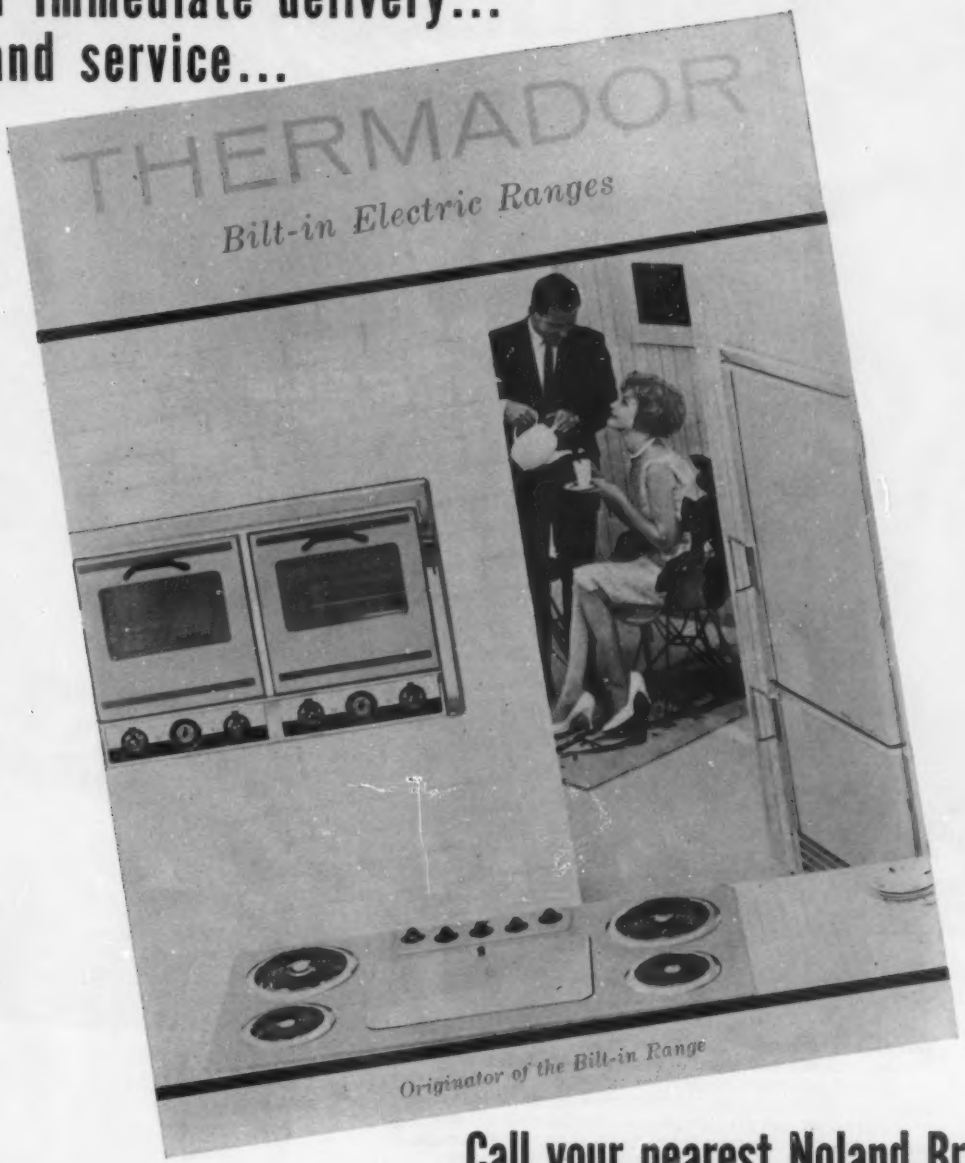

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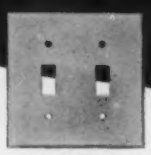

92072

92091

92073

CIRCLE F's new "Smoothie" Wall Plates—smooth and clean in design—are ideal for residential, commercial and institutional applications. The completely smooth surface prohibits dust and dirt accumulation and makes these plates ideal for painting. The simple classic design with its compound parabolic curves blends well with modern or any other decor.

Moulded of non-combustible non-absorbing thermosetting plastic all Smoothie Wall Plates have reinforced rib construction to give added strength and eliminate warping. All Smoothie plates are individually packaged in cellophane and have an envelope containing mounting screws sealed in the package.

See your distributor or write us direct.

CIRCLE F MFG. CO.

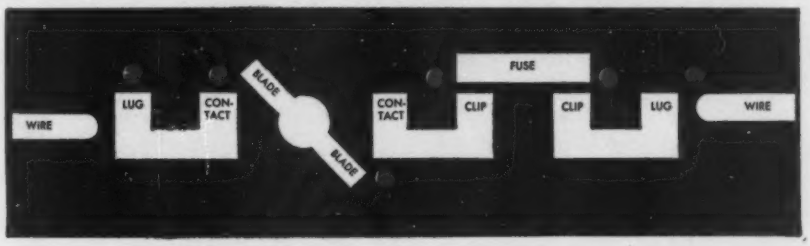
TRENTON 4, NEW JERSEY

Why General Electric's new safety switches operate cooler, last longer...

HEAVY DUTY LIGHT DUTY

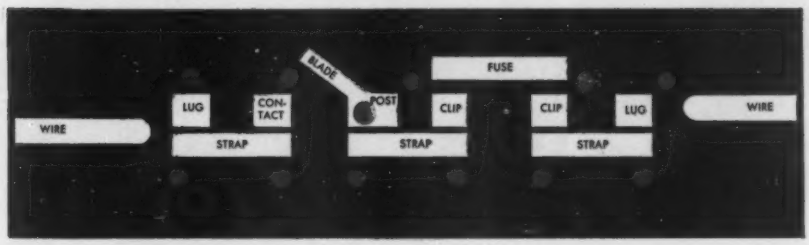
NEW G-E CONSTRUCTION—ONLY 6 JOINTS (FEWEST POSSIBLE) IN CURRENT PATH (30-100 AMP.)

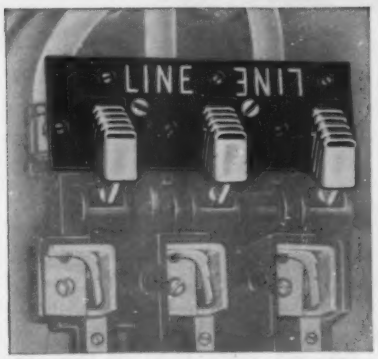
50% fewer joints in current path.



Silver-plated copper current-carrying parts.

STANDARD CONSTRUCTION—NORMALLY 12 OR MORE JOINTS





STEEL ARC CHUTE contains arc, cools and extinguishes hot arc gases. (Included on all 600 volt and 100 to 600 amp. 240 volt switches.)

- Double-break action (30-100 amp.) splits arc for longer contact life and cooler operation.
- Blades reinforced with stainless steel springs maintain contact pressure.
- Heavy Duty switches feature Quick-Make, Quick-Break mechanism to reduce arcing and contact-pitting. Impossible to tease contacts.
- Light Duty switches have spring-accelerated make and break to prevent partial contacting.

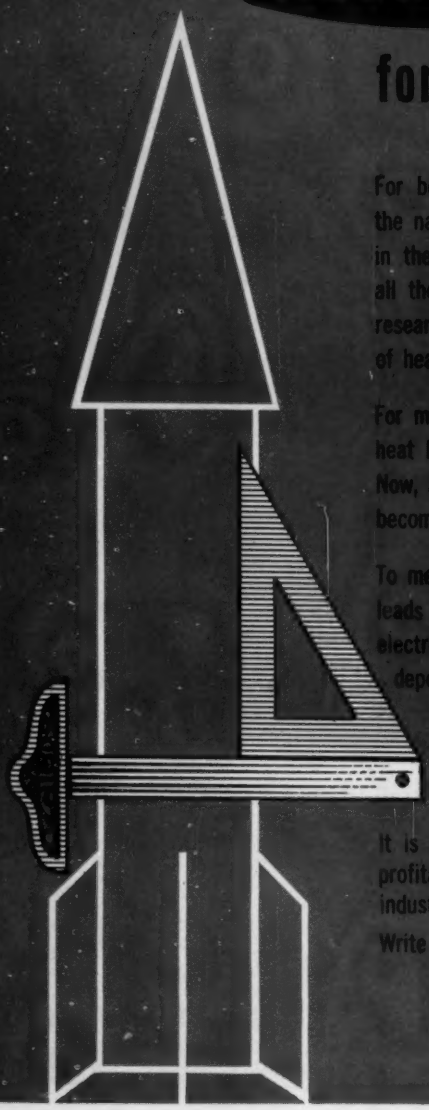
Heavy Duty (Type A) switches sell at Normal Duty (Type C) price levels. Write for Bulletin CPD-74. See your nearest G-E distributor for a demonstration.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

In the Electrical Heating Field

Look to MARTIN for Leadership



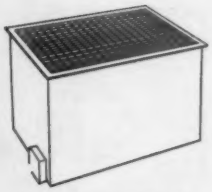
For better than half a century, the name, Martin, has been outstanding in the heating industry. Through all those years, Martin engineering and research has kept a step ahead of heating trends . . .

For many years clean, quiet electric heat has been the homeowner's dream. Now, all over the country, it is becoming a reality.

To meet this demand, Martin again leads the field with a complete electric heater line. Designed for dependable service and backed by the dependable record of 55 years of heater manufacturing experience.

It is ready now to help you build a profitable business in this progressive industry.

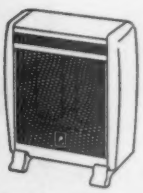
Write for details and catalogues.



ELECTRIC FLOOR FURNACES

ELECTRIC CEILING CABLE

ELECTRIC WALL HEATERS



ELECTRIC PORTABLE HEATERS

ELECTRIC BATH HEATERS

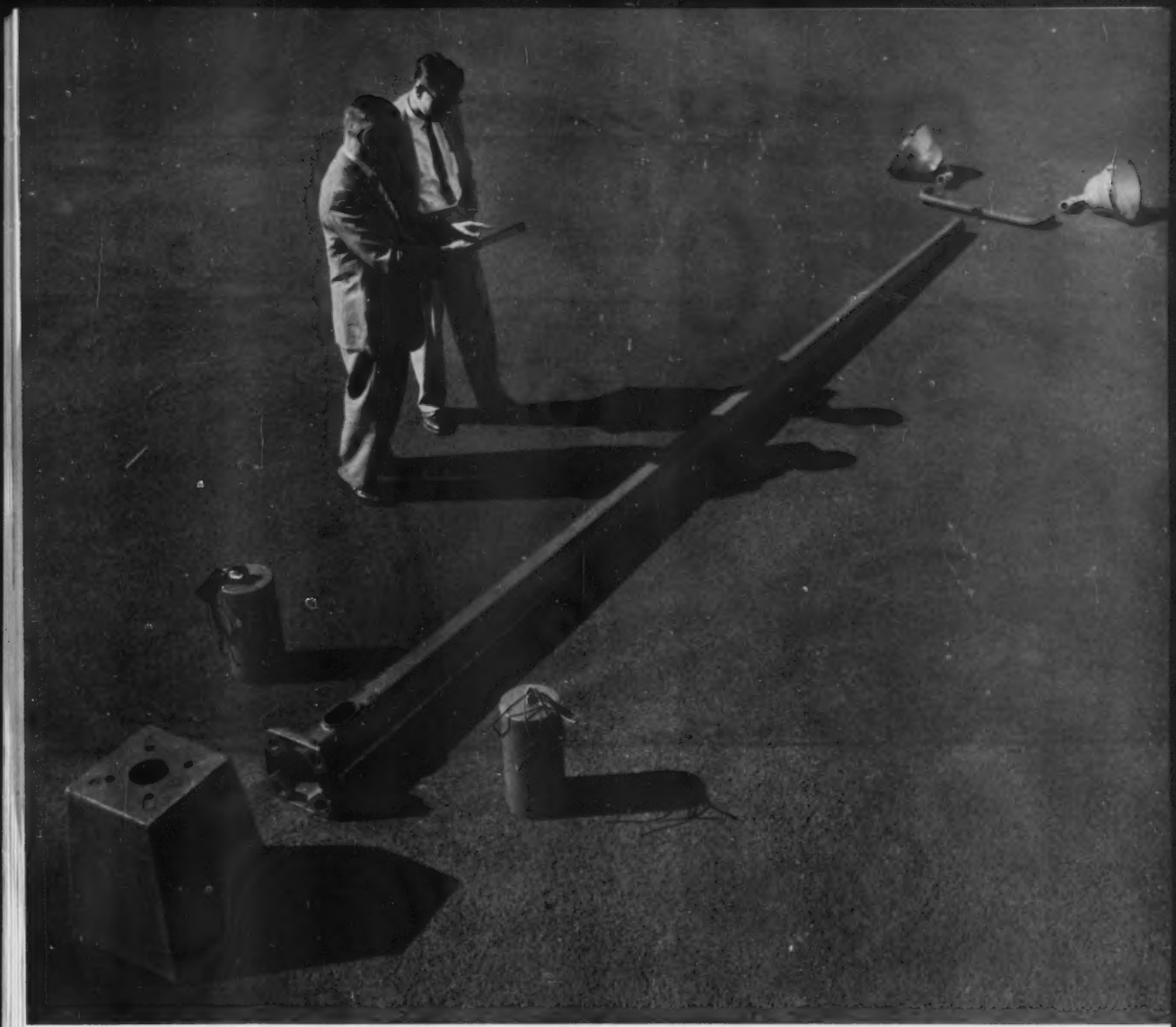
"TWIN-FIN" ELECTRIC BASEBOARDS

MARTIN

STAMPING & STOVE COMPANY

HUNTSVILLE, ALABAMA

AMERICA'S MOST COMPLETE HEATING LINE



Revere's complete line of matched outdoor lighting equipment means peak efficiency and easy installation

Shown above are the components of a Revere outdoor lighting installation. Every component — pole, base, bracket, lights — is *perfectly matched* to every other component, so the completed installation is exactly right for the job. Components "fit" right to make installation easy, they are structurally matched for strength and balance, and "design-matched" to give peak lighting efficiency for the application.

Revere offers the widest selection of outdoor lighting equipment available from any single source. You can get on-time delivery of Revere fixtures for incandescent, mercury or fluorescent lighting, as well as hinged, rigid, separable poles and accessories. Ask your wholesaler about the advantages of specifying Revere equipment.

Write for catalog of Revere's complete line of matched outdoor lighting equipment.

Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

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Long Distance Phone: NIles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles
In Canada: Curtis Lighting, Ltd., Leaside, Toronto, Ontario

Contractors tell how

Contract clarity boosts profits

By Ray P. Ehrmantraut, Jr.
Ray Electric Co.
Washington, D. C.

◆ WE HAVE developed a contract form we now use on all jobs that describes in detail the work agreed upon to be carried out for the customer. Prepared in triplicate with our own copy signed by the customer after acceptance, and a customer's copy retained by him for reference, the contract was designed to avoid misunderstanding and eliminate company losses. Other savings have resulted.

Many contractors do not use contract forms at all, or may resort to a company letterhead to describe work arranged for. Very often customers ask mechanics on a job to carry out additional work and these extras may not be accounted for or reported on the job sheet. Or in some cases, a mechanic may call back to the office to get approval. Our contract form was designed to meet these circumstances.

Since the electrician has an exact duplicate of the contract signed by the customer, there is little chance for a misunderstanding.

The face of the contract corresponds to an average worksheet with a signature line for customer acceptance. But on the back of each of the three copies there is a legal agreement relating to the disposition of all circumstances that may arise with regard to the work being carried out. Stating among other things that no changes nor extra work could be undertaken without the authorization of the customer, the form provides a line for the customer's signature. The original and duplicate are sent to the customer, the original returning to our office with the customer's signature.

When the original comes back indicating customer acceptance, the third copy becomes the mechanic's worksheet which he takes out on a job with him. Removing the lower portion with quoted prices and filing it, the office does not have to type up a worksheet for the mechanic.

When a customer raises a point regarding the work he is carrying out, the mechanic can refer to his work order which is a duplicate of the customer's. This leaves no room for misunderstanding.

Additional work or changes are placed on this pink sheet over the customer's authorization with the understanding that time and materials are to be billed him at the usual rates.

An extra job ticket is later made out which separates the extra from the original work ordered, and there remains only the need to bill the customer for the additional work.

We have found our new contract form plugging up losses that we often could not account for. A good legally sound contract protects a company under all exigencies.

Edward P. Hill, estimator, points out details in the third copy of his company's electrical contract. A duplicate of the customer's and the company's contract copies, this one will serve as a work sheet.

Materials accounting plan speeds orders, reduces chances for error

By John Colquitt
Estimator
Gaddis-Walker Electric Co.
Oklahoma City, Okla.

◆ A SIMPLIFIED system of accounting for materials used is saving us time and reducing the probability of clerical errors. One form and one listing of materials ordered for each job gives us a delivery ticket, our materials cost record, and a materials list to be attached to the customer's invoice.

The form itself is a simple one, showing our company name and address; space for date, and the name and address of the job for which the materials are ordered; with columns for quantity, description, price, and amount of materials. Assembled to be prepared in triplicate—one white, one blue and one yellow copy—it is prenumbered and prepunched.

When one of our electricians gives us an order for materials needed on a job, the order is listed on the ticket showing the name of the job and the quantity and description of materials. Prices are not included at this time.

The first step is to get one copy of the order—we use the second, or blue, one—into the hands of our deliveryman. If we do not have some of the material on hand, we

STOP PROFIT KNOCKOUT...

with the

Carol®

Protected-Profits Inventory Control Plan

When business is good—*but* your profits are taking it on the chin—just look at your inventory! Dead stock on your shelves—items that are obsolete or too slow-moving—knocks out profits every time.

Profits start with *buying*—the *right* merchandise . . . at the *right* price . . . in the *right* quantity . . . and with the *right* service and cooperation to insure rapid turnover.

That's why it'll pay you to know about the **Carol Protected-Profits Inventory Control Plan** . . . a newly developed service designed to:

- **Insure maximum turnover**
- **Eliminate obsolescence**
- **Insure adequate inventory to fill all orders promptly**
- **Insure balanced inventories**
- **Protect your profits**

STOP TAKING IT ON THE CHIN . . . Ask your Carol salesman for full details on the "Carol Protected-Profits Inventory Control Plan"—or write, wire or phone Carol Cable Company, Pawtucket, Rhode Island.

When you call for cable—call for Carol!

Portable Cords • Power Supply Cable, Types W & G • Arc Welding Cables • Cord Sets • Asbestos Types • Plastic Jacketed Cords • Thermostat Wires • And Many Others

CAROL CABLE COMPANY

Division of the Crescent Company, Inc., Pawtucket, R.I.

place an order with a wholesaler and make a notation on the ticket. The deliveryman then assembles the materials and takes them to the job.

If there is any difference between materials ordered and materials left at the job, the deliveryman shows the change on his copy of the ticket. If unused materials are brought back to the shop from a job, that is also written on his copy of the ticket.

When the delivery is completed, the ticket is returned to the office. Tickets returned by deliverymen are matched with the two copies in the office. Matching of pre-numbered tickets gives us a quick check on whether or not all delivery tickets are returned.

If changes have been made on the delivery tickets, the copies held in the office are also changed as the tickets are matched.

The office copies of the tickets are then sorted by jobs. We keep separate clipboards for major jobs under way and files for smaller ones. After tickets are sorted by jobs, cost price is listed.

On cost-plus jobs the tickets are totaled and customers are invoiced for the total material cost. Original copies of the tickets are attached to our regular invoice. The third, or yellow, copy is kept for our file. Before we started this system, invoicing required a relisting of materials used from delivery tickets to a time-and-material statement supporting our invoice.

On contract jobs the original tickets are our record of material costs on each job. A quick totaling of tickets at any time will give us our costs to date. It is no longer necessary to post itemized lists of materials used on contract jobs to a job material book.

The savings in rewriting long lists of materials two or three times has been considerable, and it naturally follows that there are fewer errors made under this system. Our customers like it also.

Wallace Caruthers, owner of City Electric, "shoots" a job before rendering an estimate. The picture helps make an exact compilation of costs, and verifies details of original equipment.

Estimator John Colquitte, of Gaddis-Walker Electric, starts a triplicate time-saving form on its way. Clipboards above the desk hold forms separately for each major job, eliminating need for relisting items.

Camera saves time, records details, helps in estimates

By Wallace Caruthers
Owner
City Electric Co.
Tampa, Fla.

◆ A CAMERA that makes a picture in a minute is a mighty useful tool in our alteration work. For example, if we've got to remove a piece of control equipment from a panel set-up in order to replace it with another, we take a picture before beginning the work.

When we get around to replacing the components, the resulting picture saves us a lot of time figuring out just where each piece

(Continued on page 120)

Who Represents YOU?

The men whose names appear in the box to the right are usually referred to as "manufacturers' representatives"—and most of you, probably, think of them as the men who represent the makers of L & P fluorescent & incandescent fixtures. This they are, of course.

In fact, they have represented L & P Lighting so well over the years that they have played a large part in helping us grow from a single, tiny plant with only 2,000 square feet to two modern facilities in two states. Our spanking new plant in Olive Branch, Miss., alone has over 110,000 square feet!

But in a larger sense, it is not L & P Lighting that these men represent . . . but you. For all of you who buy lighting fixtures, or sell them, or specify or install them, these representatives speak to us in a clear and effective voice. The suggestions, the criticisms, the needs and wishes that you have for better lighting are passed on to us through them.

We at L & P Lighting are constantly striving to improve both our fixtures and our service after the sale. Our representatives—loyal to you, their customers—wouldn't let us do otherwise, even if we wished to. Our files are stacked with "case histories" of instances where these men have rendered service far and away beyond the call of duty.

The truth is, the "manufacturer's representative" fulfills a unique function in the success story known as American free enterprise. We urge you to read the names listed to the right. Seek out the L & P representative nearest you. Get to know him. He will serve you, and serve you well.

Murray Reiter,
President

LIGHT & POWER UTILITIES CORP.

L & P LIGHTING

LIGHT & POWER UTILITIES CORP.
Olive Branch, Miss.
1035 Firestone Blvd. · Memphis, Tenn.

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There's an

L&P

Representative Near YOU!

For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

N. B. Nichols
2509 Bishop
Little Rock, Arkansas

Craig-Owen
306 E. 11th St.
Chattanooga, Tennessee

C. V. Hammon
845 S. W. 52nd St.
Oklahoma City, Oklahoma

Irving Milow
415 Clover St.
Rochester, N. Y.

Irvin Spero
4142 Stillmore Rd.
South Euclid, Ohio

Howard E. Johnson
2976 Randy Lane
Dallas, Texas

Arthur H. Swartz
2120 Polk Ave.
Houston, Texas

J. F. Hisserich
2001 Big Bend Ave.
St. Louis, Missouri

Joe E. Pearce & Associates
50 N. Kenmore
Indianapolis, Indiana

Associated Manufacturers Agents
900 Carondelet St.
New Orleans, Louisiana

Gerald Preacher
116 N. Church St.
Lexington, South Carolina

Light & Power Utilities Corp.
P. O. Box 157
Olive Branch, Mississippi

Richard B. Murdoch
7300 Bailor Ave.
College Park, Maryland

James E. Clary
62 Flicker
Memphis, Tennessee

William B. Murray
531 Western Ave., N. W.
Atlanta 14, Georgia

Surface or Semi-Recessed

SQUARE

Vandal-Proof
Tamper-Proof
Weather-Resistant

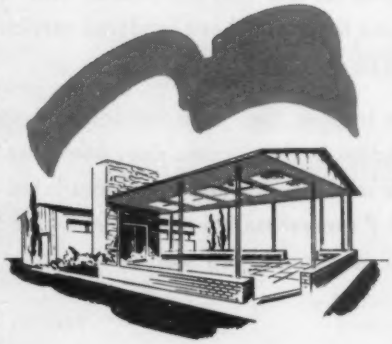
The Delta "PC-150"— The Ideal Light For Public Buildings and Areas

The PC-150 is a tamper-proof, vandal-proof lighting fixture specifically designed for use in public buildings and areas. The fixture accommodates up to two 100-watt A lamps in its double 14-gauge steel housing.

The steel mesh, welded to the outer housing, protects the Corning fresnel lens against vandalism. Theft is made difficult by spanner-head screws requiring a special screw driver for access to lamps.

Other safety items include the seating of the lens in a shock-absorbing foam-rubber gasket, a fiber-glass insulation between the fixture and the ceiling, and a safety chain to hold the outer steel housing to the inner housing to facilitate re-lamping.

All component parts of the PC-150 are phosphate-coated for rust prevention and better adhesion of white-baked synthetic enamel finish. Other colors are available.



L & P LIGHTING

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DELTA

EASIER TO DO... and costs less too!

B-M
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Here is the combination that is unbeatable when it comes to easier E.M.T. installation at less cost. New lightweight plier size indenters make setting up thin wall conduit a breeze. B-M fittings are neater too! No unsightly nuts or projecting set screws.

A few more of the plus features of B-M fittings are Concrete tight—Vibration resistant—Extra heavy bright zinc plate, salt spray and acid drip tested for corrosion resistance—Extra heavy positive bonding locknuts—Smooth rounded edges or bushed throat type connectors that prevent insulation damage—All steel construction with extra heavy gauge wall thickness.

Red Throat
BM-21B
½" Connector

Red Throat
BM-22B
¾" Connector

Red Throat
BM-23B
1" Connector

BM-41
½" Coupling

BM-42
¾" Coupling

BM-43
1" Coupling

BM-51
½" Offset Connector

BM-21
½" Connector

BM-22
¾" Connector

BM-23
1" Connector

BM-No. 600
Changeable Jaw Indenter

BM-No. 1000
Handvise for ½", ¾" and 1" E. M. T.

BM-No. 100
Cutter for ½", ¾" and 1" E. M. T.

BM-No. 607
½" Indenter
BM-No. 608
¾" Indenter

UL

TELESCOPE BM SYSTEM

All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

More than 1800 fluorescent fixtures in Old American's new building help create this striking nighttime impression.

ARCHITECTS: VOSCAMP AND SLEZAK

MECHANICAL ENGINEERS: SCOTT AND KINNEY

110 footcandles of glare-free illumination are maintained throughout, including this attractive lounge for employes.

How Old American Insurance Co. ended the great lighting search with Day-Brite

True to Missouri tradition, Old American Insurance Co. adopted a "Show Me" attitude when considering lighting for their new Kansas City headquarters.

Working closely with their architect and consulting engineer, they contacted their local power and light company engineers. Consulted the experts at General Electric's famed Nela Park. Even made their Addressograph Department a "lighting laboratory" and installed competitive fixtures side-by-side.

Result? For lighting effectiveness with high visual comfort, over-all economy with trouble-free maintenance, and pleasing appearance, Day-Brite lighting was the clear-cut choice.

May we show *you?* Call your Day-Brite representative, listed in the Yellow Pages, for the FACTS and FIXTURES! *Day-Brite Lighting, Inc., St. Louis, Mo. and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

Modular design, incorporating Day-Brite Mobilex® with Cleartex® enclosures, permits complete flexibility in arranging offices and work areas.

DAY-BRITE

NATION'S LARGEST MANUFACTURER OF
COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

A development of Orangeburg and Flintkote Research Laboratories, new *klean-kote* Orangeburg Conduit has a tough, non-brittle, protective coating for cleaner, safer handling. Ask your Wholesaler to show you a length now.

klean-kote* ORANGEBURG® Fibre Conduit

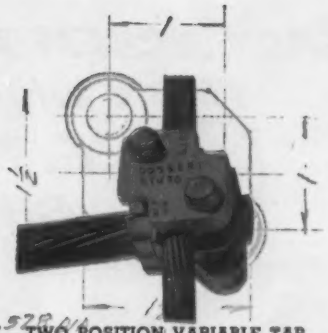
FLINTKOTE

Orangeburg Manufacturing Co., Orangeburg, N.Y. Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products

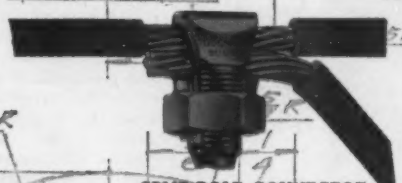
*KLEAN-KOTE IS A TRADE-MARK; U. S. PATENT APPLIED FOR. ORANGEBURG KLEAN-KOTE IS DISTRIBUTED BY GRAYBAR ELECTRICAL CO. AND GENERAL ELECTRIC SUPPLY CO. WITH BRANCHES AND STOCKS IN PRINCIPAL CITIES.

DOSSERT DESIGNED

with YOU in mind!



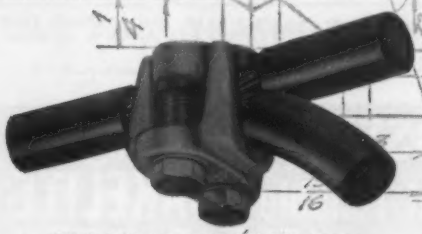
TWO POSITION VARIABLE TAP
(Type GTX)
For cross, parallel and tee tap connections.



SPLIT BOLT CONNECTOR
(Type DS)
For taps, dead-ends, entrances, motor leads, junction boxes, etc.

LIGHT DUTY VARIABLE LUG
(Type G)
For economical, all-purpose cable connections.

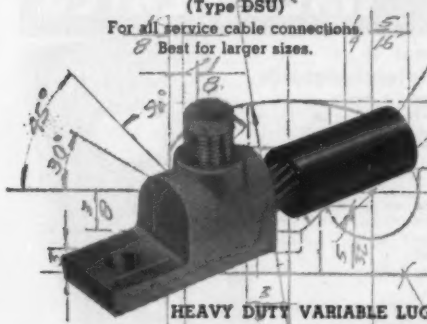
VARIABLE TERMINAL
(Type D)
Connects a wide range of copper conductors to flat bar.



TWO BOLT SERVICE CONNECTOR
(Type DSU)
For all service cable connections.
Best for larger sizes.

For YOU, the contractor...
For YOU, the wholesaler...

The products shown here are in constant demand by contractors and are fast moving stock items. All items accept a wide range of cables, thereby, minimizing the number of stock sizes. They are packaged in convenient quantities for ease of handling and are attractively labeled for quick identification.



HEAVY DUTY VARIABLE LUG
(Type HL)
Takes various conductor sizes.
Quickly installed.

Ask for pocket catalog, giving name of your distributor.

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT MFG. CORP.
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Representatives in principal cities.

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"EASY ASSEMBLY... That's why I like E.T.P Fittings!"

E·T·P exclusive pre-set staked screw with deep slotted head makes working easy—even in the tightest areas. There is **no backing out** when inserting conduit.

CONCRETE TIGHT! One piece, solid tubular steel—cannot open or spread. Available in all sizes from ½" to 2".

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Samples and Brochure on Request.

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ELECTRIC TUBE PRODUCTS

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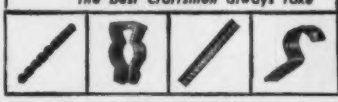
PAINE'S New HEAVY-DUTY SENIOR BEAM CLAMP

Helps You Do The Job Faster and Easier Than Ever Before!

- Most dependable universal support for fastening heavy piping, conduits, hanger rods, etc. onto ceiling channel, web joists, "I" beams, etc.
- Also proves reliable when used as insulator's support.
- Mates ideally with any Paine Conduit clamp.
- Provides a hidden method of holding conduits, pipes, cable above false ceilings.
- Keeps conduit runs straight and even.
- Features a case-hardened, hexagon-headed, *slotted*, cup-pointed screw.
- *Slotted* screw head makes installation faster, easier.
- Results in time-savings, reduced costs.

Contact your nearest Paine representative for free samples. Also ask for Paine's New Junior Beam Clamp and New Liberty Conduit Clamp.

the best craftsmen always take



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THE PAINE COMPANY 81-S WESTGATE ROAD ADDISON, ILLINOIS

MASSEY still making the "old reliable" BAKELITE HEAVY DUTY WALL PLATES

Conventional & Interchangeable

BAKELITE: Brown & Ivory
- Competitive—19 types, up to 4 gang.
- Heavy Duty—22 types, up to 6 gang.
- T. V.—Single and Multi Set Hookups

METAL: Any type. Combinations up to 8 gang.
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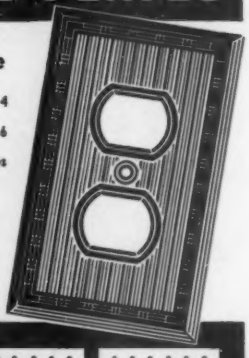
- Chrome—Chrome Brass
- Stainless Steel
- Enameled
- Unfinished
- Oil Burner and Air Conditioning
- 040 Brushed Brass



Single and Multi-gang Wall Plates and Electric Wiring Devices.

Send for catalog and prices today

A. H. MASSEY, INC.

P. O. Box 206
DERBY, CONN.

Tube mill operator here keeps close watch as he adjusts weld heat on control console.

Contractors find:

CIRTUBE* EMT maintains uniform high quality

KNOWING that the EMT you use is always of the same high quality—from tube to tube, bundle to bundle, and month to month—is one sure way to help guarantee better electrical jobs at lower installation costs.

CIRTUBE EMT is like that. Made in a brand new plant, with ultra modern equipment, the latest techniques, and the most stringent quality control measures that experienced engineers can devise, CIRTUBE EMT has already acquired a reputation for unsurpassed uniform quality and workability.

Uniform, high quality is only one of many reasons why CIRTUBE EMT helps get better, more profitable wiring jobs.

Why don't *you* try CIRTUBE EMT on your next job — you'll like working with it. Now at your Circle wholesaler's. *Trade Mark

C W C **CIRCLE** WIRE & CABLE *a subsidiary of* CERRO DE PASCO CORPORATION

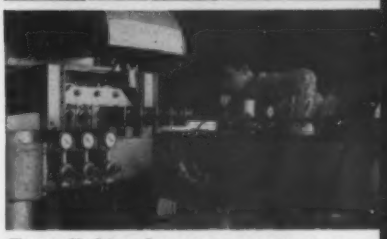
PLANTS: Maspeth and Hicksville, N. Y. SALES OFFICES & WAREHOUSES: In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*

Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.



Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.

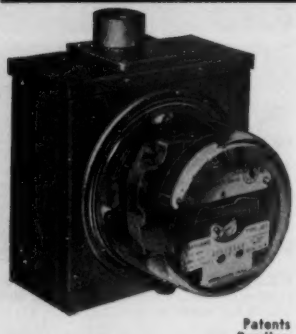
Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

Patents Pending

CATALOG WVL-0150A-2"
Size 10½" x 8" x 3⅝"
Up to 150 Amp. Capacity



Patents Pending

CATALOG WV-011-A-1¼"
Size 8" x 8" x 3⅝"
Up to 100 Amp. Capacity

LOOKING for Something? Designed for the Application

B & C'S ORIGINAL RINGLESS METER SOCKETS

LIGHT DUTY, MEDIUM DUTY, HEAVY DUTY SOCKETS

SINGLEPHASE, POLYPHASE, COMBINATION DEVICES

HORIZONTAL GANG, VERTICAL GANG, SOCKET UNITS

INDOOR AND OUTDOOR TRANSFORMER CABINETS

COMBINATION TRANSFORMER - METER ENCLOSURES

UNIQUE TRANSFORMER MOUNTING BRACKETS

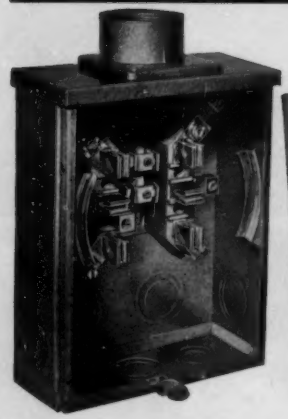
OUTDOOR AND INDOOR METERING ENCLOSURES

SERVICE MAST CLAMPS AND OTHER ACCESSORIES

INDOOR AND OUTDOOR METER CONNECTING CABINETS

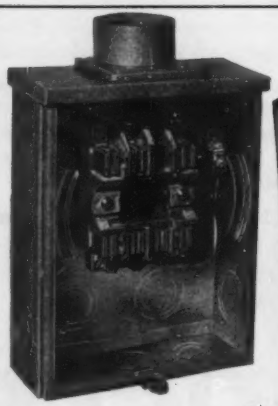
METER SOCKET ACCESSORIES, PARTS, SPECIAL DEVICES

B & C's Revolutionary, Unique, Designs Flexible, and Unexcelled in Performance Keeping Pace With the Electrical Industry



Patents Pending

CATALOG WVL-0175A-2"
Size 10½" x 8" x 3⅝"
175 Ampere Capacity
3-Gang Ground
5th and 6th Terminals
Added Line Terminals for
connection to other sockets



Patents Pending

CATALOG WVL-1007-A-2"
Size 10½" x 8" x 3⅝"
7-Terminals — 100 Amp. Capacity

Write for descriptive catalog containing installation data and current price list.

B and C

Your Seal of Dependability and Safety

METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA

UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance

Supervisory control gets new treatment with "solid-state" elements—see page 74

Single-phase or three-phase for residential units—page 58
Conductor heat dissipation-4—page 60
Labor unit data for outside construction-4—page 62
Cable progress helps triplex trend—page 66
Pressure relief system protects arresters—page 67

Single-phase or three-phase for residential air conditioning

By F. R. Smith
Operations Supt., Beaumont Div.
Gulf States Utilities Co.
Beaumont, Texas

◆ SHOULD small, central type, residential air conditioning units be served single-phase or three-phase? This is a current topic for discussion within the organizations of many electric utility companies at the present time, and it is well that it should be. Through active promotional programs, residential air conditioning is rapidly acquiring public acceptance as a "way of life" in our Southern area, and the percentage saturation of this type load is steadily increasing.

The answer to the question and the solution to the problem, is, of course, one in which each individual company will have to determine for itself, as factors other than engineering economics enter into the picture, such as customer and contractor prejudices that will have to be overcome and service policies that will have to be changed.

The Gulf States Utilities Company serves approximately 250,000 residential cutsomers located, for the most part, within a narrow strip of land along the Gulf Coast, this strip being approximately 100 miles wide and 350 miles long. The principal cities served by the Company are Baton Rouge and Lake Charles in Louisiana, and Beaumont, Orange, and Port Arthur in Texas.

Customer characteristics

Approximately 1,000,000 people live within the confines of our territory. The per capita buying income of the area is relatively high, approaching $1,450 per year, and in the larger cities it nears $1,800 per year. A very high percentage of all our customers live in single family dwellings.

The number of customers and our peak demands have been rising at a rapid rate since the end of World War II. Last summer, a record peak of 1,040.8 megawatts was established. With a 26 per cent saturation in window unit customers and 5 per cent in central units, we conservatively estimate that approximately 77,500 kilowatts was in residential air conditioning.

By 1970, we expect to have 345,000 residential customers. Due to the increasing personal incomes of our customers, with their corresponding desire for a better standard of living, our sales organization feels that the potential residential air conditioning market is enormous; they predict that by 1970 we will have over 200,000 kilowatts of this business.

Based on our success of the past two years with the Medallion Home Program, which has proved to our satisfaction that a good promotional program will provide a relatively high saturation in air conditioning of new homes, we think that this estimate is entirely reasonable. Therefore, those of us with design, construction, and operation responsibilities must accept the challenge for developing practices and policies that will assure this potential business for our respective companies.

Inasmuch as the distribution plant investments in most companies will exceed 40 per cent of the total plant investments, it stands to reason that even small percentage reductions on a per customer basis will reward us with substantial total savings.

In order to assure ourselves of this potential business, we must maintain profitable rates, and since our distribution plant investment is such an important figure in our rate base, it behooves us all to take a good, hard look at these facilities with the thought in mind of finding ways and means of reducing unit costs.

The management of the Gulf States Utilities Company had been concerned about this problem for quite some time, but it was only after the manufacturers developed a satisfactory single-phase motor that could compete in price and performance with comparable three-phase motors that a real serious study was made. It was realized that if any savings and advantages were to be derived from a change in service policy, certainly that policy should be put into effect as early as practicable in order to realize its full benefits.

Single-phase favored

Our studies proved conclusively that substantial savings could be made in serving these three and five ton central air conditioning units at single-phase rather than three-phase. It is not my intent to detail this cost analysis, as a number of fine magazine articles have been written and a host of fine papers have been presented which substantiate the economic advantages to be gained. I do think it is worth while, however, at this time to review some of the advantages obtained by serving these loads single-phase. These are:

(1) More economical meter installation.

(2) More economical service installation (both customer and company).

(3) Simpler and more economical transformer installation.

(4) Relatively high power factor (92 to 93%) modern single phase motors.

(5) Reduced voltage flicker.

(6) Elimination of motor troubles due to voltage unbalance.

(7) Elimination of motor troubles due to circuit single-phasing.

(8) Fewer customers on line interrupted by single-phase faults.

(9) Simplified distribution lines in residential areas.

(10) Lower wiring cost to customer.

With all of these listed advantages in favor of using single-phase equipment, the problem still remained as to just how to put such a policy change in effect—how to overcome prejudices, etc. Our rate people were able to help us immeasurably by altering our residential rates so that it would provide a substantial saving to our high-use air conditioning customers. This rate reduction was justified, in some part, by the potential savings in distribution plant investment that would be realized under this new policy.

A tremendous amount of planning was done by our sales organization in developing a program that could effectively put a policy change like this into force without adversely affecting our customer and public relations. The program was deemed satisfactory, and our service policy was changed so as to favor a potential single-phase air conditioning customer. It reads as follows:

"Due to the substantial investment generally required to render three phase service where available a minimum connection charge of $100 will be made for each new three-phase service connected where the largest three-phase motor to be served is less than 7-½ hp, or in case customer has several three-phase motors, the sum of their ratings is less than 10 hp.

"There may arise cases where the company determines that a particular load, however small, should be served at three-phase and in such case upon the approval of the division manager the connection charge herein may be waived. Advice of each waiver should be sent to the rate department with the reason for the waiver. An example of situations where the connection charge would be waived would be in an area supplied by a three-phase 120/208 volt network.

"The connection charge will be more than $100 where under company's extension policy the ratio of estimated cost of facilities to estimated additional revenue exceeds the allowable limits. In the case of refundable extension contracts, $100 will not be refundable.

"The connection charge described above will be over and above all other charges in the applicable rate schedule."

Mr. John Doe
Standard Appliance Company
754 Main
Beaumont, Texas

Dear John:

Gulf States Utilities Company is continuously studying its operations in a sincere effort to maintain the lowest possible rates for its electric service and, at the same time, provide our customers with the highest standard of service. With the constant increase in the cost of fuel, materials, labor and taxes, it is becoming increasingly more difficult to keep our rates down. We, along with you, naturally desire electric rates which are attractive, economical and competitive with other sources of energy.

We now have an opportunity to make a further move in the direction of keeping costs down and since our cost of doing business must inevitably be reflected in our rates, we ask your help in this matter as it will benefit all parties concerned.

Due to the improvement in characteristics of single-phase motors, it is now practicable to serve three ton and five ton residential air conditioning and/or other residential motors of less than 7½ hp at single phase rather than three-phase and the difference in cost to us is substantially less for single-phase service facilities. There is no difference in the operating costs, and very little difference in the price, of single-phase and three-phase equipment and we can render service of the highest quality at single-phase.

Effective immediately, it will be our normal and preferred practice to render service at single-phase to motor loads which are made up of small motors, the largest of which is less than 7½ hp in size, or where the sum of the ratings is less than 10 hp.

Where three-phase secondary service is available, or can be made available economically, company will supply service to motor loads at three-phase where the motors or units are as large or larger than the minimum sizes stated above. If three-phase service is insisted upon to motor loads that do not meet the above minimum requirements as to size, three-phase connection may be supplied under special arrangements whereby a contribution to the company of not less than $100 will be required to defray part of excess cost involved.

Along with this move, we are offering our Texas cities and towns a highly promotional and greatly simplified residential rate, with energy at 1.5¢ per kwh, exclusive of water heating, available during the summer months after 600 kwh usage per month, and 1.17¢ per kwh, exclusive of water heating, available during the winter months after 600 kwh usage per month. Copy of this rate is attached. This new rate is sure to open up an even broader field of house heating, central air conditioning, heat pump use, and a large number of other items to help people "Live Better Electrically."

We feel that the Gulf Coast area served by Gulf States is one of the brightest spots in the nation and we are doing all we know to do to keep plenty of electric power available for every use, and at costs that are in reach of everyone. We invite your help in this program.

Yours sincerely,
R. A. McAlpine
Sales Superintendent
Beaumont Division

This letter was an effective aid in selling the electrical trades people on the new policy favoring single-phase service.

Prior to the announced policy change, our sales organization was very active in carrying out the planned program.

(1) Sales supervisors conducted meetings with their own personnel, explaining to them the reasons for the policy change and arming them with all of the necessary background information for talking to their customers, etc.

(2) Sales supervisors conducted meetings with operating personnel of our company and explained to them the policy and rate change and armed them with information to help sell this program to our customers.

(3) Sales personnel delivered, personally, the form letter (see insert) to electrical contractors, air conditioning distributors, air conditioning dealers, home builders, building contractors, city officials, and city inspectors.

At each of these personal contacts, the reason for the policy change was explained in detail and all questions were answered and objections were overcome. An inventory was made of all three-phase equipment of dealers stocks and all were given a reasonable time to dispose of this equipment without penalty. In some cases, our people were able to get orders changed that had already been placed.

This policy change, together with the rate reduction, was well received by all concerned except the electrical contractors. The contractors were unduly concerned about losing control of their wiring business through "bootleg operations." They felt that more individuals or more "jack-leg" electricians would attempt to wire single - phase equipment than would attempt the more complicated wiring of three-phase equipment.

Numerous meetings were held with the various electrical contractor associations, and they were finally convinced that they stood to gain business just as our company hoped to gain business through a potential increase in the number of residential air conditioning customers that would be obtained through this reduced rate. They were also convinced that they could, with the proper advertising program, sell the general public on the superior wiring job that they were capable of giving.

After fifteen months of opera-

(Continued on page 120)

Conductor heat dissipation - 4

By Fred C. DeWeese
Consulting Engineer
Raleigh, N. C.

◆ THE TWO PRECEDING articles in this series (April and June issues) included the working out of a typical problem of determining the heat loss and current carrying capacity of a copper conductor. This issue includes data for calculating heat losses and current carrying capacities of stranded aluminum conductors.

Values have been computed and compiled in Table 5 for use in calculating heat losses and current carrying capacities of stranded aluminum conductors. The values in this table were derived in the same manner and are used in the same manner as are those in Table 2, applying to copper. (See explanation below Table 2).

Example 3: With a 4/0 aluminum cable having a temperature rise of 45 degrees C above 25 degree still air, it is required to find the following (a) current carrying capacity in amperes; (b) ratio of current carrying capacity to that for copper of the same size for the same temperature rise.

Solution for (a): The heat loss

(Continued on page 68)

Table 5 - Physical and other properties for use in calculating heat losses and current carrying capacities of aluminum cables

AWG	C.M	Wires	"d" dia. in.	$d^{.81}$	2.302585 x d	"S" sq. in.	"A" sq. in. per inch length	"A" sq. in. per ft. length	5280 x A sq. in. per mile
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
6	26,251	7	0.18372	0.25407	0.423019	0.020617	0.57717	6.9259	36,569
4	41,742	7	.23166	.30587	.533426	.032784	.72778	8.7335	46,113
3	52,634	7	.26014	.33599	.598992	.041339	.81725	9.8070	51,781
2	66,373	7	.29212	.36907	.672640	.052129	.91772	11.0128	58,148
1	83,694	7	.32803	.40541	.755326	.065733	1.03054	12.3666	65,295
1/0	105,538	7	0.36836	0.44535	0.848189	0.082890	1.1572	13.8870	73,395
1/0	105,538	19	.37265	.44953	.858051	.082890	1.1707	14.0485	74,176
2/0	133,079	7	.41365	.48918	.952453	.104520	1.2995	15.5940	82,336
2/0	133,079	19	.41845	.49383	.963526	.104520	1.3145	15.7753	83,294
3/0	167,805	7	.46449	.53734	1.069523	.131794	1.4592	17.5093	92.449
3/0	167,805	19	0.46989	0.54240	1.08196	0.131794	1.4762	17.7144	93,532
4/0	211,600	7	.52159	.59036	1.20101	.166191	1.6386	19.6635	103,823
4/0	211,600	19	.52766	.59581	1.21497	.166191	1.6577	19.8922	105,030
	250,000	37	.57540	.63911	1,32490	.196350	1.8014	21.6920	114,533
	266,800	7	.58560	.64835	1.34859	.209545	1.8397	22.0798	116,582
	266,800	37	0.59442	0.65627	1.36869	0.209545	1.8674	22.4089	118,319
	300,000	19	.62828	.68628	1.44667	.235620	1.9738	23.6856	125,060
	300,000	37	.63032	.68809	1.45135	.235620	1.9802	23.7623	125,465
	336,400	19	.66531	.71886	1.53192	.264209	2.0901	25,0814	132,430
	336,400	37	.66746	.72075	1.53688	.264209	2.0967	25.1626	132,859
	350,000	37	0.68082	0.73242	1.56764	0.274890	2.1389	25.6662	135,518
	397,500	19	.72321	.76913	1.66524	.312197	2.2720	27.2642	143,955
	477,000	19	.79223	.82808	1.82418	.374636	2.4574	29.8664	157,695
	500,000	19	.81111	.84402	1.86764	.392700	2.4582	30.5780	161,452
	500,000	37	.81373	.84593	1.87369	.392700	2.5878	30.6770	161,975
	556,500	19	0.85571	0.88143	1.97034	0.437075	2.6882	32.2594	170,330
	636,000	37	.91775	.93284	2.11320	.499514	2.8832	34.5985	182,680
	715,500	37	.97342	.97842	2.24139	.561954	3.0581	36.6972	193,761
	750,000	37	.99662	.99726	2.29479	.589050	3.1310	37.5715	198,377
	795,000	37	1.02608	1.02110	2.36264	.624393	3.2235	38.6823	204,243
	874,500	37	1.07616	1.0613	2.47795	0.686832	3.3806	40.5703	214,211
	954,000	37	1.12401	1.1003	2.58813	.749272	3.5312	42.3742	223,736
	1,000,000	61	1.15233	1.1217	2.65334	.785400	3.6202	43.4418	229,373
	1,000,000	91	1.15311	1.1233	2.65513	.785400	3.6226	43.4712	229,528
	1,033,500	37	1.16991	1.1355	2.69382	.811711	3.6754	44.1046	232,872
	1,113,000	61	1.21567	1.1714	2.79918	0.874150	3.8191	45.8297	241,981
	1,192,500	61	1.25837	1.2046	2.89750	.936590	3.9533	47.4394	250,480
	1,192,500	91	1.25922	1.2053	2.89946	.936590	3.9560	47.4715	250,649
	1,272,000	61	1.29994	1.2367	2.99322	.999028	4.0839	49.0066	258,755
	1,351,500	61	1.33963	1.2672	3.08461	1.061468	4.2083	50.5029	266.655
	1,431,000	61	1.37847	1.2969	3.17404	1.123907	4.3306	51.9671	274,386
	1,510,500	61	1.41624	1.3257	3.26101	1.186347	4.4492	53.3910	281,904
	1,590,000	61	1.45304	1.3535	3.34575	1.248786	4.5649	54.7783	289,230
	1,590,000	91	1.45403	1.3542	3.34805	1.248786	4.5680	54.8160	289,429

Note: For method of deriving table values see notes under Table 2.

Table 6 — Effective 60-cycle resistance of 61 per cent* conductivity aluminum — ohms per mile

Size	Temperature Degrees C 0	5	10	15	20	25	30	35	40
6	3.1508	3.2211	3.2914	3.3616	3.4319	3.5022	3.5725	3.6428	3.7131
4	1.9816	2.0258	2.0700	2.1142	2.1584	2.2026	2.2468	2.2910	2.3352
3	1.5716	1.6066	1.6417	1.6767	1.7118	1.7468	1.7818	1.8169	1.8519
2	1.2464	1.2742	1.3020	1.3298	1.3576	1.3854	1.4132	1.4410	1.4688
1	0.9885	1.0106	1.0326	1.0547	1.0767	1.0987	1.1208	1.1428	1.1649
1/0	0.78410	.80157	.81904	.83652	.85399	.87146	.88894	.90641	.92388
2/0	.62200	.63586	.64971	.66356	.67742	.69128	.70513	.71899	.73284
3/0	.49350	.50448	.51546	.52645	.53743	.54842	.55940	.57039	.58137
4/0	.39166	.40036	.40907	.41777	.42647	.43518	.44388	.45259	.46129
250	.33176	.33912	.34648	.35384	.36121	.36857	.37593	.38330	.39066
266.8	0.31099	.31788	.32478	.33168	.33857	.34547	.35237	.35926	.36616
300	.27680	.28293	.28902	.29519	.30132	.39744	.31357	.31971	.32584
336.4	.24711	.25256	.25802	.26348	.26894	.27440	.27987	.28533	.29079
350	.23760	.24285	.24809	.25334	.25858	.26384	.26906	.27433	.27958
397.5	.20954	.21415	.21876	.22337	.22798	.23260	.23722	.24183	.24645
477	0.17515	.17901	.18281	.18664	.19048	.19412	.19834	.20200	.20583
500	.16726	.17091	.17456	.17821	.18187	.18552	.18918	.19284	.19650
556.5	.15066	.15394	.15721	.16048	.16376	.16708	.17032	.17360	.17688
636	.13237	.13522	.13807	.14093	.14379	.14665	.14951	.15237	.15524
715.5	.11820	.12072	.12325	.12578	.12831	.13085	.13337	.13591	.13845
750	0.11296	.11541	.11781	.12022	.12263	.12504	.12746	.12991	.13229
795	.10692	.10937	.11144	.11371	.11598	.11822	.12052	.12279	.12502
874.5	.09775	.09978	.10183	.10388	.10586	.10798	.11004	.11210	.11417
954	.09013	.09199	.09385	.09573	.09760	.09947	.10134	.10329	.10510
1000	.08629	.08806	.08984	.09162	.09340	.09517	.09696	.09874	.10054
1033.5	0.08372	.08543	.08715	.08886	.09059	.09229	.09402	.09574	.09748
1113	.07826	.07944	.08143	.08301	.08459	.08618	.08778	.08937	.09097
1192.5	.07357	.07503	.07650	.07797	.07945	.08091	.08239	.08388	.08535
1272	.06948	.07084	.07223	.07358	.07495	.07611	.07771	.07909	.08047
1351.5	.06591	.06718	.06856	.06973	.07102	.07230	.07360	.07488	.07618
1431	0.06275	.06494	.06514	.06634	.06755	.06811	.06996	.07117	.07239
1510.5	.05994	.06106	.06219	.06332	.06446	.06559	.06673	.06788	.06902
1590	.05743	.05849	.05956	.06062	.06169	.06276	.06388	.06492	.06600

Size	Temperature Degrees C 45	50	55	60	65	70	75	80	85
6	3.7833	3.8536	3.9239	3.9942	4.0645	4.1348	4.2050	4.2753	4.3456
4	2.3794	2.4236	2.4678	2.5120	2.5562	2.6004	2.6446	2.6888	2.7330
3	1.8870	1.9220	1.9571	1.9921	2.0272	2.0622	2.0973	2.1323	2.1674
2	1.4965	1.5243	1.5521	1.5799	1.6077	1.6355	1.6633	1.6911	1.7189
1	1.1869	1.2089	1.2310	1.2530	1.2750	1.2971	1.3191	1.3412	1.3632
1/0	0.94137	.95884	.97632	.9938	1.0113	1.0288	1.0462	1.0637	1.0812
2/0	.74670	.76056	.77441	.78827	.80213	.81599	.82984	.84370	.85756
3/0	.59235	.60334	.61433	.62531	.63630	.64729	.65827	.66926	.68025
4/0	.47000	.47871	.48742	.49612	.50483	.52051	.52225	.53095	.53966
250	.39803	.40540	.41276	.42013	.42749	.43487	.44223	.44960	.45697
266.8	0.37306	.37996	.38686	.39376	.40067	.40757	.41447	.42138	.42835
300	.33197	.33810	.34424	.35037	.35651	.36264	.36878	.37492	.38105
336.4	.29626	.30173	.30719	.31266	.31813	.32360	.32907	.33453	.34000
350	.28483	.29008	.29534	.30059	.30561	.31110	.31635	.32161	.32686
397.5	.25107	.25569	.26031	.26493	.26955	.27417	.27880	.28343	.28804
477	0.20967	.21351	.21735	.22120	.22504	.22889	.23273	.23658	.24043
500	.20014	.20382	.20749	.21116	.21482	.21848	.22215	.22582	.22948
556.5	.18017	.18345	.18674	.19002	.19331	.19660	.19989	.20318	.20647
636	.15810	.16096	.16383	.16670	.16957	.17244	.17531	.17819	.18106
715.5	.14099	.14352	.14607	.14861	.15115	.15370	.15624	.15879	.16134
750	0.13470	.13712	.13956	.14197	.14439	.14682	.14924	.15167	.15410
795	.12734	.12961	.13189	.13419	.13645	.13783	.14102	.14332	.14563
874.5	.11622	.11826	.12035	.12242	.12325	.12654	.12862	.13069	.13276
954	.10698	.10887	.11076	.11264	.11453	.11642	.11829	.12020	.12209
1000	.10232	.10412	.10591	.10770	.10950	.11131	.11310	.11491	.11671
1033.5	0.09920	.10093	.10266	.10440	.10614	.10788	.10962	.11135	.11289
1113	.09257	.09417	.09577	.09738	.09897	.10059	.10220	.10381	.10541
1192.5	.08688	.08833	.08981	.09130	.09280	.09429	.09592	.09728	.09878
1272	.08186	.08327	.08463	.08602	.08741	.08881	.09020	.09160	.09298
1351.5	.07747	.07878	.08007	.08138	.08268	.08399	.08530	.08661	.08792
1431	0.07360	.07482	.07605	.07727	.07850	.07973	.08096	.08219	.08343
1510.5	.07017	.07131	.07246	.07362	.07477	.07594	.07709	.07825	.07941
1590	.06708	.06817	.06926	.07034	.07144	.07253	.07363	.07472	.07559

*Effective 60-cycle resistance values for the new 62% aluminum will follow in a later issue.

Estimating labor unit data for

◆ ADDITIONAL tables are presented this month in the series covering man-hour labor units for outside electrical construction.

These are being published by special permission of Gulf Publishing Co., Houston, Tex., being part of their recently published book, "Estimator's Electrical Man-Hour Manual," by John S. Page and Jim G. Nation.

As explained in the first article which appeared in the March 1960 issue of ELECTRICAL SOUTH, the labor units given in these tables are based on average productivity efficiency. Copies of that first article, explaining the productivity factors and methods of evaluating the data will be sent to new readers upon request (Address request to The Editor, ELECTRICAL SOUTH, 806 Peachtree St., NE, Atlanta, Ga.)

The labor unit tables in this issue cover excavation, duct encasement, and concrete manhole construction, and thus complete the series on outside electrical construction.

In the tables relating to excavation operations, labor unit data is given for different types of soil. Before an estimate is made on excavation, it is well to know the kind of soil that may be encountered. For this reason, soils have been divided into five general classifications according to the difficulty experienced in excavating them. Soils vary greatly in character and no two are exactly alike. The following definitions will help the estimator make better use of the tables on labor units for excavation operations.

Light soil—Earth which can be shoveled easily and requires no loosening, such as sand.

Medium or ordinary soil—Type of earth easily loosened by pick. Preliminary loosening is not required when power excavating equipment such as shovels, dragline scrapers and backhoes are used. This type of earth is usually classified as ordinary soil and loam.

Heavy or hard soil—This type of soil can be loosened by pick but is sometimes very hard to do. It may be excavated by sturdy power shovels without preliminary loosening. Hard and compacted loam containing gravel, small stones and boulders, stiff clay or compacted gravel are good examples of this type.

Hard pan or shale—A soil that has hardened and is very difficult to loosen with picks. Light blasting is often required when excavating with power equipment.

Rock—Requires blasting before removal and transporting. (May be divided into different grades such as hard, soft or medium.)

All data presented in this article copyrighted 1959 by John S. Page and Jim G. Nation.

Excavation for poles

Net manhours each

Manhours are for all labor involved in the above types of excavation under average conditions and in accordance with the following typical crews. Typical hand digging crew: foreman, truck driver and four workers. Typical power digger crew: foreman, truck driver and two workers. Manhours are for maximum hole diameter of 2'0". Manhours do not include equipment usage. If hole locations are hard to get to and work area is small and limited, add for these factors.

Hole Depth	Hand Excavation				Power Excavation
	Sand or Loam	Wet Sticky Clay	Slate	Rock	
4' Hole Depth	1.95	3.90	8.45	9.10	.91
5' Hole Depth	2.60	5.20	9.88	10.40	1.04
6' Hole Depth	4.55	9.10	12.74	13.78	1.30
7' Hole Depth	5.20	10.40	15.60	16.25	1.56
8' Hole Depth	6.24	12.48	18.20	19.50	1.95
9' Hole Depth	7.80	15.60	20.80	23.40	2.34
10' Hole Depth	10.40	20.80	24.70	27.30	2.60
Dynamiting (Av. per Hole in Rock)	-	-	-	-	8.5
Dewatering (Av. per Hole)	-	-	-	-	8.5

Hand excavation for ducts and manholes

Net laborer manhours per cu. yd.

Manhours include picking and loosening where necessary and placing on bank out of way of excavation or loading into trucks or wagons for hauling away. Manhours do not include hauling and unloading. For description of various soils, see introduction.

Type of Soil*	Excavation	First Lift	Second Lift	Third Lift
Light	General Dry	1.07	1.42	1.89
Light	General Wet	1.60	2.13	2.83
Light	Special Dry	1.34	1.78	2.37
Medium	General Dry	1.60	2.13	2.83
Medium	General Wet	2.14	2.85	3.79
Medium	Special Dry	1.07	2.49	3.31
Hard or Heavy	General Dry	2.67	3.55	4.72
Hard or Heavy	General Wet	3.21	4.27	5.68
Hard or Heavy	Special Dry	2.94	3.91	5.20
Hard Pan	General Dry	3.74	4.97	6.61
Hard Pan	General Wet	4.28	5.69	7.57
Hard Pan	Special Dry	4.01	5.33	7.09

outside electrical construction — 4

Machine excavation for ducts and manholes

Net manhours per 100 cu. yds.

Manhours are for operational procedures only and do not include equipment rental or depreciation. This must be added in all cases. Operation includes excavating and dumping on side line or into trucks for hauling but does not include hauling. See sheets on hauling for this charge. For excavations deeper than six feet, add 25% to above manhours. For descriptions of various soils, see introduction.

Light, Medium and Heavy Soil

Equipment	LIGHT SOIL			MEDIUM SOIL			HEAVY SOIL		
	Oper. Engr.	Oiler	Laborer	Oper. Engr.	Oiler	Laborer	Oper. Engr.	Oiler	Laborer
Power Shovel:									
1 cu. yd. Dipper	1.1	1.1	1.1	2.0	2.0	2.0	2.7	2.7	2.7
3/4 cu. yd. Dipper	1.5	1.5	1.5	2.8	2.8	2.8	3.7	3.7	3.7
1/2 cu. yd. Dipper	2.0	2.0	2.0	3.7	3.7	3.7	4.9	4.9	4.9
Backhoe:									
1 cu. yd. Bucket	1.4	1.4	1.4	2.6	2.6	2.6	3.5	3.5	3.5
3/4 cu. yd. Bucket	1.5	1.5	1.5	3.8	3.8	3.8	3.7	3.7	3.7
1/2 cu. yd. Bucket	2.0	2.0	2.0	3.7	3.7	3.7	4.9	4.9	4.9
Dragline:									
2 cu. yd. Bucket	0.7	0.7	0.7	1.3	1.3	1.3	1.7	1.7	1.7
1 cu. yd. Bucket	1.1	1.1	1.1	2.0	2.0	2.0	2.7	2.7	2.7
1/2 cu. yd. Bucket	2.0	2.0	2.0	3.7	3.7	3.7	4.9	4.9	4.9
Trenching Machine	-	-	-	3.8	-	7.5	4.8	-	9.4

Hard Pan and Rock

Equipment	HARD PAN			ROCK		
	Oper. Engr.	Oiler	Laborer	Oper. Engr.	Oiler	Laborer
Power Shovel						
1 cu. yd. Dipper	3.4	3.4	3.4	3.4	3.4	3.4
3/4 cu. yd. Dipper	4.6	4.6	4.6	4.6	4.6	4.6
1/2 cu. yd. Dipper	6.1	6.1	6.1	6.1	6.1	6.1
Backhoe:						
1 cu. yd. Bucket	4.4	4.4	4.4	4.4	4.4	4.4
3/4 cu. yd. Bucket	4.6	4.6	4.6	4.6	4.6	4.6
1/2 cu. yd. Bucket	6.1	6.1	6.1	6.1	6.1	6.1
Dragline:						
2 cu. yd. Bucket	-	-	-	-	-	-
1 cu. yd. Bucket	-	-	-	-	-	-
1/2 cu. yd. Bucket	-	-	-	-	-	-
Trenching Machine	-	-	-	-	-	-

Rock excavation for ducts and manholes

Net manhours per cu. yd.

Net manhours for drilling, blasting and loading per cubic yard of rock in place in ground. Manhours are for above described operations only. For hauling see respective manhour table. Equipment and materials charges must be added in all cases.

Operation	Labor Hours per Cubic Yard		
	Soft	Medium	Hard
Hand Drill, Plug and Feathers	15.0	21.0	30.0
Hand Drill, Blasting	13.0	16.0	22.0
Machine Drill, Plug and Feathers	8.0	11.0	14.0
Machine Drill, Blasting	4.0	6.0	7.0

Shoring and bracing trenches

Net manhours per 100 sq. ft.

Manhours include hauling, erecting and stripping.

Operation	Laborers	Carpenters	Truck Drivers
Placing	3.0	3.0	0.4
Removing	2.5	-	0.4

Backfilling and tamping

Net manhours per cu. yd.

Manhours for hand shoveling and tamping is that of common labor. Manhours for bulldozer placing is that of operating engineer. All manhours are based on backfill materials being located within shoveling distance of excavated area.

Soil	Hand Shovel Placed	Bulldozer Placed	Tamped 6" Layers
Light	0.60	0.04	-
Medium	0.80	0.07	1.00
Heavy	1.00	0.10	1.20

Duct encasement and manhole forms

Manhours per hundred sq. ft.

Manhours include all operations as outlined above. For re-use of wood forms add factors as appear above. Manhours do not include excavation, the installation of ducts, or the placement of concrete. See respective tables for these charges.

Description	Manhours			
	Carpenter	Laborer	Truck Driver	Total
WOOD FORMS				
Duct Encasement or Manhole Footings:				
Fabricate	2.50	.75	-	3.25
Erect	2.00	1.00	.08	3.08
Strip & Clean	.50	1.50	.08	2.08
TOTAL	5.00	3.25	.16	8.41
Manhole Walls:				
Fabricate	2.50	.75	-	3.25
Erect	3.50	1.00	.10	4.60
Strip & Clean	1.00	2.50	.10	3.60
TOTAL	7.00	4.25	.20	11.45
METAL FORMS				
Metal Wall Forms:				
Erect & Brace	4.50	1.75	.15	6.40
Strip & Clean	.50	2.00	.25	2.75
TOTAL	5.00	3.75	.40	9.15
FACTORS FOR RE-USE OF WOOD FORMS				
Repairs 1st Re-Use	1.25	.50	-	1.75
Repairs 2nd Re-Use	1.50	.50	-	2.00
Repairs 3rd Re-Use	2.00	.75	-	2.75
Oiling after each Re-Use	-	1.00	-	1.00

Duct encasement and manhole concrete

Net manhours per cu. yd.

Manhours include the placement of ready-mix concrete, vibrating and puddling. If wood chutes are used, ample carpenter time has been allowed for the fabrication and repair of minor chutes. Manhours do not include mixing or hauling or finishing of concrete.

(Continued on page 68)

Description	Manhours		
	Laborer	Carpenter	Total
Duct Encasement & Manhole Footings:			
Ready-Mix from Truck	.50	-	.50
Ready-Mix with Wood Chute	.60	.10	.70
Manhole Walls:			
Ready-Mix from Truck	.60	-	.60
Ready-Mix with Wood Chute	.75	.12	.87

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Cable developments spell progress for triplex trend in secondaries

By C. M. Fredrickson
Technical Superintendent
Southern Electrical Co.*
Chattanooga, Tenn.

◆ DURING the last ten years, this company has participated in the steady increase in the acceptance and use of triplex conductors for secondary installations. Triplex conductors were originally developed for use as service drop installations, replacing the three separate weatherproof conductors previously used.

This newer cable construction consists of two insulated conductors twisted about a bare electrical neutral that also serves as the strength messenger for the cabled system. It was, therefore, a logical continuation when, in the early 1950's, several electric utility companies began experiments with this type of cable system for secondaries. Since that time, construction practices have improved, and specific hardware has been developed for the phase wire and messenger taps. These improvements in hardware, together with improvements resulting from additional experience in the stringing, have encouraged others to take advantage of this conductor application.

Principal advantages

The advantages of this system as compared with three weatherproof conductors will, of course, vary from system to system and from company to company. However, the principal and outstanding advantages are:

Cost reduction. Initial installation cost is reduced by taking into account the savings in hardware resulting from elimination of the additional fittings required to affix three wires, and the reduced labor needed for stringing one composite cable compared with stringing three individual wires and performing the necessary adjustments to obtain proper parallel spacing.

Appearance. A clean single cable from pole to pole greatly improves the general appearance and appeals to the aesthetic sense of the customer and property owner.

Electrical efficiency. The closer spacing of the conductors results in a reduction of the voltage drop, improving the electrical performance of the system. Under typical conditions, for example, a #4/0 AWG triplex secondary will have 26 per cent less voltage drop than the same size conductor in an open wire system. Expressed another way, a #3/0 AWG triplex will have the same voltage drop as a larger #4/0 AWG open-wire weatherproof.

Improved service reliability. ACSR messengers result in a corresponding greater resistance to falling and breaking tree limbs. This improved storm reliability, plus the improved resistance to abrasion by tree limbs, has been a big factor in the acceptance of this system.

Improved safety. When the triplexed secondary is used, only the messenger must be connected to the pole using a simple, single bolt-clamp assembly. Other house or service drop connections are usually made by attachment to the messenger and to the phase wires at a distance of one to three feet from the pole. The new method gives improved safety for crews adding or changing out other equipment attached to the energized pole. In addition, the system permits a relatively simple pole change compared with the former system of three separate wires and associated hardware.

Reduced tree-trimming. Use of a single messenger wire in place of three separate conductors sharply reduces required space. In areas of heavy foliage, tree-trimming is similarly reduced. Although not recommended as a tree wire, cable with the improved insulation offers considerable resistance to a nominal amount of tree-limb abrasion.

Larger secondaries needed

The initial installations of these types of conductors were in the size range of #2 and #1/0 AWG; in recent years, however, larger and larger quantities of power have been needed to accommodate such items as heat pumps and central air conditioning. This has resulted in larger triplex secondaries. Sizes up through and including 336,400 CM are presently in use.

It was soon apparent that these larger sizes imposed new and more severe requirements on the conductor and the insulation than the previously used smaller sizes. To meet these requirements, a product development program was undertaken with the cooperation of du Pont, producers of "Hypalon" synthetic rubber.

Synthetic meets need

The availability of this new improved type of elastomer known as "Hypalon," together with "Compresto" conductor constructions in both 7- and 19-wire sizes, has made possible improvements in triplex service drops and secondary cables.

"Hypalon" is a synthetic rubber that may be compounded and processed in a manner similar to neoprene and other natural and synthetic rubbers. In the development of insulation from a compounded material, certain properties can be emphasized. The philosophy of compounding at Southern Electrical Company has been to produce "Hypalon" insulation for these constructions with electrical values similar to those presently attainable by the "Two-Coat" constructions and to develop the maximum in weather resistance and mechanical properties.

Three types of insulation are commonly used for triplex service drops. They are neoprene, polyethylene and "Two-Coat." In the majority of cases, utility engineers have found either neoprene or polyethylene to be adequate, and

*Southern Electrical Company is a division of Olin Mathieson Chemical Corp. "Compresto" is a registered trademark of Southern Electrical Co.; "Hypalon" is a registered trademark of E. I. du Pont de Nemours & Co.

the field histories developed to date tend to confirm these decisions.

There are, however, certain instances in which the properties of neoprene or polyethylene singly are inadequate. In these cases utility engineers specify a "two-coat" construction consisting of a coating of "rubber" insulation covered with a neoprene jacket. A combination of these two materials—insulation for the electrical properties and neoprene for protection—results in advantages not attainable with either of the two common coverings.

"Hypalon" insulation over "Compresto" conductors will develop properties that equal and exceed those attainable with "two-coat" coverings.

Triplex secondaries

Triplex constructions, initially designed for small sizes and for service drops, have found increasing acceptance as secondaries in sizes up through 336,400 CM. The increased performance required by this trend has resulted in a need for an improved insulating material and cable construction.

In our opinion, du Pont's "Hypalon" insulation combines the best of the physical and electrical properties of the previously used insulations, and "Compresto" cable constructions complement these properties and add advantages of their own.

The conductors have been designed in aluminum. Initially, Southern Electrical had developed and promoted the use of "Compresto" in the 7-wire constructions. The advantages of this construction are reduced diameter with corresponding reductions of ice and wind loading; reduced weight by elimination of compound normally used to fill the conductor interstices; increased surface area for bolted type connectors and fittings, and improved resistance to compression cutting.

For example, a typical #4/0 triplex construction will result in a 7 per cent reduction in diameter and a 4 per cent reduction in total weight.

These constructions were available up through and including #4/0. However, a #4/0 7-wire construction is extremely stiff and difficult to handle in a triplex secondary construction. In order to maintain the advantages of the "Compresto" conductor, a 19-wire construction was developed in

(Continued on page 68)

Improved pressure relief system protects station-type arresters

◆ AN IMPROVED pressure-relief system for station-type lightning arresters that gives positive protection against explosion of failed units has been announced by Westinghouse Electric Corporation.

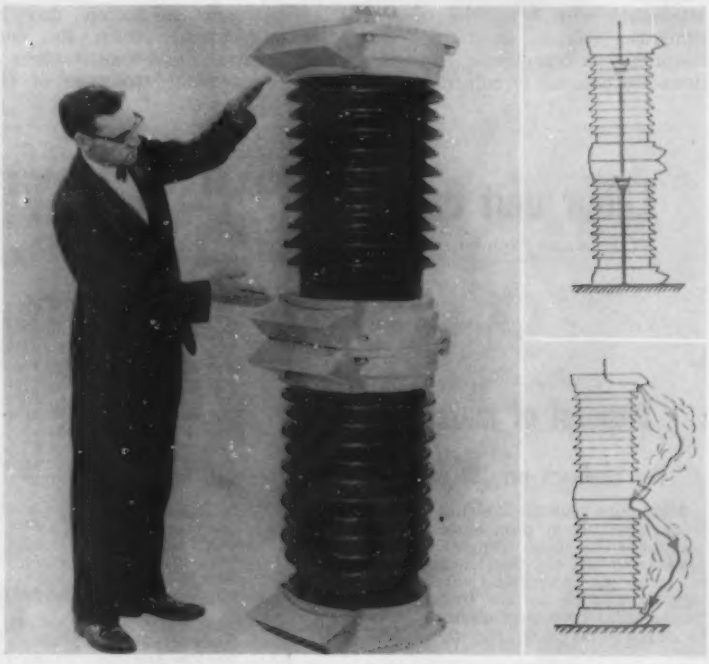
When an arrester fails—that is, loses its ability to limit or interrupt power-follow current—the resulting arc almost instantly creates excessive internal temperatures. Some arrester parts vaporize raising internal pressures to dangerous levels in a fraction of a cycle. If this pressure is not relieved instantly, the arrester may explode.

The new pressure-relief system incorporates several features to insure fail-safe operation.

Two breakable metal diaphragms located at top and bottom of the arrester are designed to rupture before internal pressure exceeds a safe limit. To insure this rupture at exactly the right instant, a small projectile is placed near each diaphragm, spring-loaded to maintain proper orientation. "Fired" by gas pressure generated by the fault current, it cracks the diaphragm.

The hot ionized gases are expelled to the outside through exhaust ports that deflect the two streams of ionized gas toward each other. The two jets merge on the outside of the arrester unit and transfer the arc from the inside in less than ¼ cycle.

The aluminum alloy end castings have been reshaped to provide a greater cross section for the exhaust to prevent excessive back pressure after the diaphragm opens. Exhaust port hoods are slanted to shed water and to reduce pressure needed to blow free. Ample head room for the diaphragm breakout is obtained with a deeper end casting, but over-all arrester length remains the same.



The small drawings at right shows how the improved station type arrester functions to transfer arc from inside the arrester to outside if it should fail to limit or interrupt power-follow current.

Triplex trend

(Continued from page 67)

sizes #1/0 through 336,400 CM. This allowed the advantages of the 7-wire "Compresto" constructions while improving the flexibility to a satisfactory degree for the larger sizes.

The requirements for conductor insulation on the larger sizes for secondary application are considerably more severe than those required by a service drop installation. To meet this need, Southern Electrical has developed a color-coded conductor insulated with "Hypalon" for secondary services which offers many outstanding features.

Positive phase identification is accomplished by the colored insulation permitting electrical load balancing. A triplex system will have conductors of black and red. Correspondingly, quadruplex constructions will have conductors of black, red and gray. These colors are designed with a dull red and gray sufficiently distinctive to give the linemen positive identification and yet to be unobtrusive to the passer-by.

In terms of insulation resistance and dielectric strength, performance of cable insulated with "Hypalon" is comparable to that attainable with a combination of synthetic rubber insulation and neoprene jacket. These constructions are commonly referred to as "two-coat." The excellent electrical properties of "Hypalon" permit its being rated as a 600-volt class triplex.

"Hypalon" has excellent resistance to ordinary chemicals that may be encountered in the field and in normal handling. Its resistance to oil is good, and its low temperature flexibility is satisfactory at the temperatures encountered in line service.

Another outstanding feature of "Hypalon" is its exceptional resistance to ozone. By definition, ozone is chemically-active oxygen and may occur in the atmosphere surrounding high-voltage conductors. Its action on ordinary insulations causes rapid cutting and cracking.

Since "Hypalon" is a vulcanized elastomer, it will not melt or soften and flow during conditions of emergency electrical overload. The material will not support combustion, and it readily passes the Underwriters' vertical flame test.

"Hypalon" insulation over "Compresto" conductors has demonstrated a marked improvement in resistance to compression cutting at both elevated and room temperatures. This sharply improved resistance to compression cutting and flow at room and elevated temperatures is required for the larger sizes of conductors.

This new insulation can be stripped readily from the conductor at all field temperatures.

The chemical structure of the "Hypalon" molecule has no weak double bond carbon to carbon links that are susceptible to oxidation with resulting loss of flexibility. This results in a conductor insulation that maintains its physical properties over a longer period of time.

Conductor heat

(Continued from page 60)

derived from the solution to Example 1 of 0.428511 watts per square inch for the 4/0 copper will hold for the 4/0 aluminum. From Table 6 (similar to Table 3), the effective 60-cycle resistance of 4/0 aluminum at 70° C is 0.52051 ohm per mile. From Table 5, column (10), A is seen to be 103,823 sq. in. Then from equation (3)

$$I = \sqrt{\frac{103{,}823 \times 0.428511}{0.52051}}$$

$= 292$ amperes at 60 cycles.

Solution for (b): Ratio of current carrying capacity $= \sqrt{\frac{0.31680}{0.52051}} =$ 0.78. Also $292/375 \times 100 = 78$ per cent. (Note: It is unnecessary to plot temperature-current curves for aluminum, since the current carrying capacity will be 78 per cent of that indicated on Fig. 4 for equal size conductors. When there is no exact equal size, interpolation between the curves will be sufficiently close.)

Labor unit data

(Continued from page 64)

Disposal of material

Net manhours per 100 cu. yds.

Manhours include round trip for truck, spotting at both ends, unloading and labor for minor repairs and maintenance to vehicle. For loading and excavating, see respective manhour listings. Manhours do not include equipment rental or depreciation. This must be added in all cases.

Length of Haul and Truck Capacity	Average Speed 10 M. P. H.		Average Speed 15 M. P. H.		Average Speed 20 M. P. H.	
	Truck Driver	Laborer	Truck Driver	Laborer	Truck Driver	Laborer
3 cu. yd. Truck:						
One Mile Haul	15.0	2.8	11.6	2.8	10.5	2.8
Two Mile Haul	21.8	2.8	16.2	2.8	14.0	2.8
Three Mile Haul	28.2	3.0	20.6	3.0	17.3	3.0
Four Mile Haul	36.0	3.0	26.8	3.0	21.0	3.0
Five Mile Haul	41.7	2.5	-	-	-	-
4 cu. yd. Truck:						
One Mile Haul	11.3	2.1	8.8	2.3	7.9	2.1
Two Mile Haul	16.2	2.0	12.0	2.0	10.4	2.2
Three Mile Haul	21.6	2.1	15.8	2.3	13.2	2.1
Four Mile Haul	26.4	2.0	18.7	2.0	15.6	2.0
Five Mile Haul	31.3	1.3	-	-	-	-
5 cu. yd. Truck:						
One Mile Haul	9.0	1.7	7.0	1.7	6.3	1.7
Two Mile Haul	13.0	1.7	9.7	1.7	8.3	1.7
Three Mile Haul	17.1	1.8	12.3	1.8	10.4	1.7
Four Mile Haul	21.0	2.0	15.0	2.0	12.4	1.6
Five Mile Haul	25.0	1.7	-	-	-	-
8 cu. yd. Truck:						
One Mile Haul	5.6	1.0	4.8	1.0	4.0	1.0
Two Mile Haul	8.2	1.0	6.0	1.0	5.2	1.0
Three Mile Haul	10.5	0.9	7.8	0.9	6.5	1.0
Four Mile Haul	13.2	1.0	9.2	1.0	7.6	1.0
Five Mile Haul	15.6	1.0	-	-	-	-

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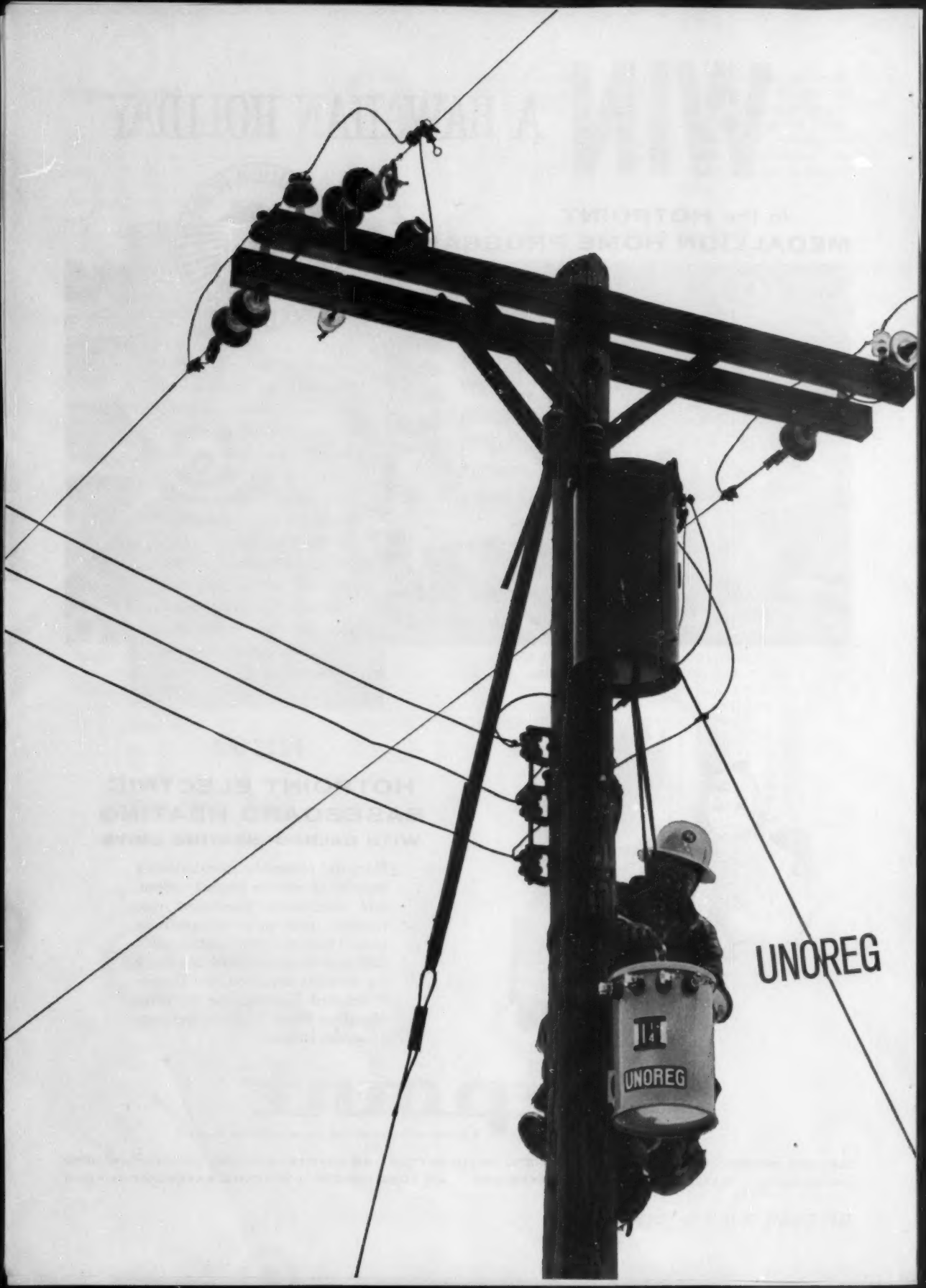
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Because of its small size (21½" high, 12¼" in diameter), Unoreg is whisked up the pole in record time, installs easily on the secondary side of the transformer. And just as easily, it can be moved to other locations for emergencies, spot loads or changing line conditions, without disturbing a single transformer. Unoreg doesn't even have to be installed on the same pole with the transformer. This is a virtual impossibility with either the usual cumbersome regulators or with combination transformer-regulator equipment. Here is ease of handling and flexibility of application you can readily translate into thousands of dollars saved, as you use Unoreg.

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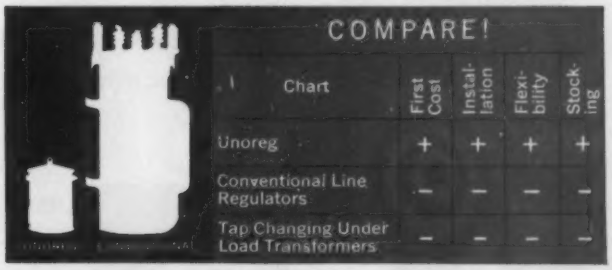

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Extremely long life, even at high overloads, may be obtained from Moloney Distribution Transformers incorporating Duratherm, a new high temperature insulation. Transformers incorporating Duratherm will be available in single-phase ratings 167 KVA and smaller, and in three-phase ratings 150 KVA and smaller.

Duratherm is an insulating paper which has been especially processed during manufacture to reduce the rate of deterioration when subjected to high temperatures. This insulation is completely compatible with the other material used in the transformers.

This new insulation permits operation of the transformers at considerably higher hottest-spot temperatures than was formerly possible with standard kraft paper insulation. This means even better performance for Moloney Distribution Transformers which are already noted for their high overload capacity and long life.

LATION FOR MOLONEY SFORMERS PROVIDES

The application of Duratherm insulation does not affect the basic design of the transformers. No change in losses, loss ratio or impedances is involved. Transformers with Duratherm will continue to have ASA Standard 55 C KVA ratings, but due to the high temperature insulation, will have an additional nameplate rating at 65 C average temperature rise. This additional rating will be 12% higher than the 55 C rating.

The cooling capacity of Duratherm-insulated Distribution Transformers will not be changed. Because of this, even when operating at the much higher overloads possible with these transformers, oil temperature will not be such that special high temperature oil will be required.

MEBD-21

The increased KVA capacity and longer operating life resulting from the use of Duratherm insulation are but two of the many advantages to be obtained by using Moloney Distribution Transformers. Ask your Moloney representative for additional information on Duratherm and the other features of Moloney transformers which result in superior performance.

MOLONEY ELECTRIC CO.

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

MISSOURI, AND TORONTO, ONT., CANADA

Transistorized supervisory control

◆ A SIGNIFICANT advance in the art of supervisory control—new solid-state equipment—for remote indicating, telemetering and control of any apparatus which has provision for local control has been developed by General Electric and described and demonstrated at a recent press conference.

Solid-state supervisory has widespread application in the petroleum field, the utility area, and in the chemical and other industries.

Pioneering in the field of centralized control since 1927, G-E has produced in the new supervisory equipment a system that uses modern transistors coupled with a proven space-code type of operation.

Transistorized logic elements, the thinking components of the equipment, direct and receive operation messages to and from remote apparatus through a master station-remote station system. These elements are plug-in cards utilizing transistors and diodes. There are no moving parts.

Completed shipments will be fully tested at the company's Medium Voltage Switchgear plant in Philadelphia prior to delivery for a given application. With no moving parts, there are no adjustments to be made in the field. Computers were used in the design of the new equipment to give logic elements optimum in-the-field performance.

General Electric design engineers fed all possible operating data into the computers to obtain a correlation which expedited the design of circuitry for the new solid-state equipment.

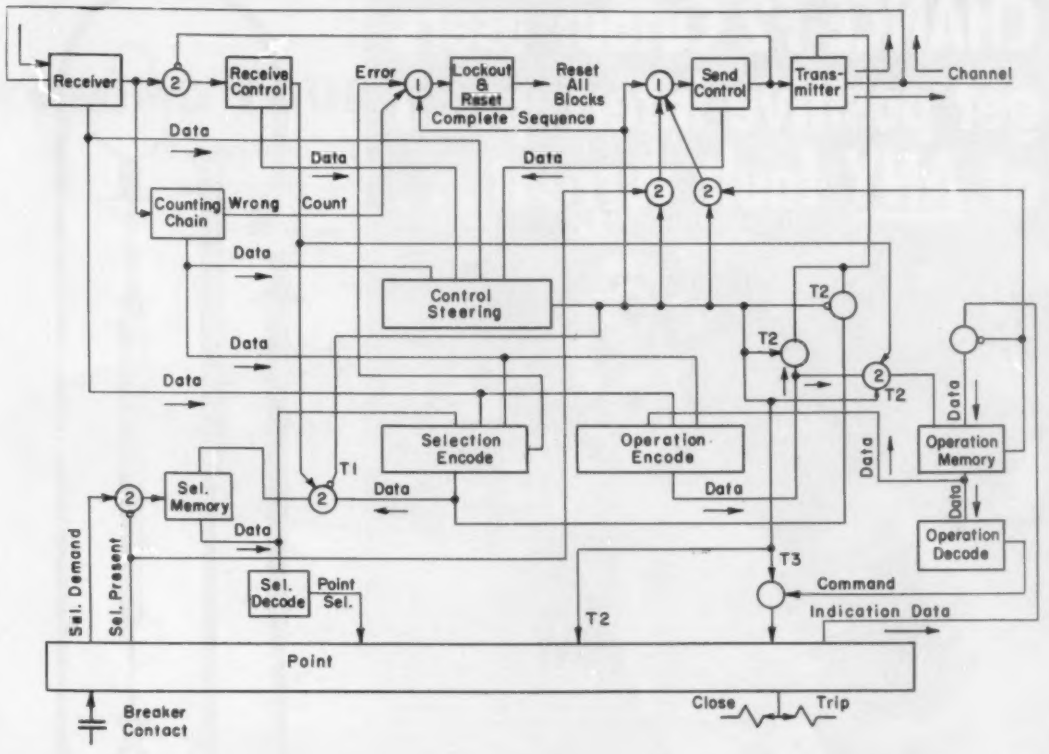
The new equipment is designed to operate on any two-way communication channel including low-cost telegraph-grade leased wire.

Using the space-code system, the master station sends signals to remote stations in the form of pulses and pauses with operating intelligence carried by the pauses. Each control point has its own code that cannot be mistaken by the equipment for another code. A point on the master station consists of a grouping of indicating lamps and a key to initiate selection. The lamps indicate when the code has been established between the master station and the remote station; when action has been initiated and completed; and an alarm indication for each specific point.

Since each code or point is composed of both pulses and pauses, rather than pulses alone, it is less susceptible to distortions that might cause misoperation. Should enough distortion occur to add or subtract a pulse, the equipment locks out and resets itself.

Heart of the new solid-state supervisory control equipment is displayed here by A. R. Christman. The logic elements are plug-in cards utilizing transistors and diodes. There are no moving parts.

The new equipment is designed to be functionally compatible with conventional relay-type systems. Both weight and floor space have been greatly reduced, says Glen E. Guy, project design engineer.



This function diagram shows supervisory equipment at a remote station which is similar to that furnished for the master station. Functions of the various elements are described below.

The Receiver is a device able to distinguish "pulse and space" conditions on the channel.

The Counting chain is a series of memory units arranged to turn "on" sequentially. As each unit is turned on, the unit preceding it is turned off. The chain advances one step each time the receiver recognizes a pulse. The counting chain keeps tabs on the number of pulses as well as acting as a commutator to collect or distribute data in response to the pulse number.

Receiver control is a memory unit operated by the receiver, which keeps the station in the receiving mode once a signal is received from the master station.

Control steering keeps track of each transmission signalled by the receiver, and causes the station to perform the correct succeeding step in the over-all sequence.

Selection (operation) memory recognizes appropriate selection codes.

Selection (operation) decoder breaks down the code in the selection memory into the specific point selection.

Send control with control steering is a memory unit which controls the transmitter and co-ordinates the station for sending purposes.

Selection (operation) encoder, acting in response to data from the counting chain, receiver, and selection memory, provides data to the transmitter to select the proper pauses, and to the selection memory to rack up information if a point is not already selected.

Transmitter is a free-running pulse-generator which sends the selected code back to the master station.

Operation memory is a series of memory units, one for each bit of the command code. The code is injected directly by either the common keys on the remote station panel, or by the receiver in response to an incoming signal.

Operate decode is similar to selection decode in operation.

Operate encode is similar to selection encode in its operation.

Point equipment is the device which causes the remote apparatus to respond to the command of the supervisory equipment.

Lookout and reset serves to lock the station to inhibit further action, and when all is quiet, to reset the station to the normal "at rest" condition ready to receive new intelligence from the master station.

When communication is first established between the master and remote station by selection of a point, there is an immediate and automatic check-back which tells the equipment that a communication code has been established correctly. The operator can then perform the remote operation with complete confidence.

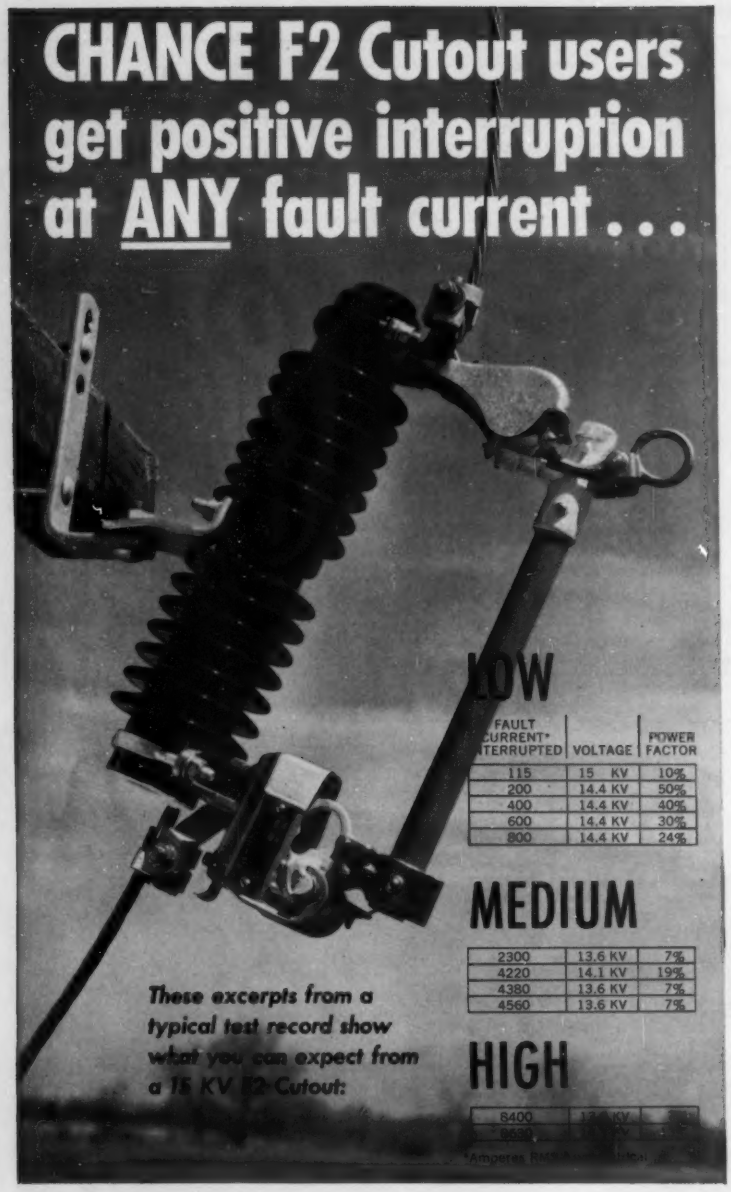
Engineered to be functionally compatible with conventional relay-type systems, solid-state equipment can be mated as a master unit with existing relay-type remote units, or added as additional remote stations in an all-relay system. With floor space requirements reduced by as much as 50 per cent and no increase in height over conventional units, installation of the new supervisory equipment is much simpler. Weight reductions up to 25 per cent also contribute to installation versatility.

Control voltage for the solid-state logic elements is provided by a twelve-volt self-contained battery. According to design engineer G. E. Guy, the entire system could be operated in an emergency by a standard twelve-volt automobile battery for 8 hours.

All external electrical connections are isolated by protective relays to shield the equipment's operating components from the possible effects of accidental overvoltages that might burn out the transistors. These safeguards were added to help eliminate human error during installation and operation.

(Continued on page 119)

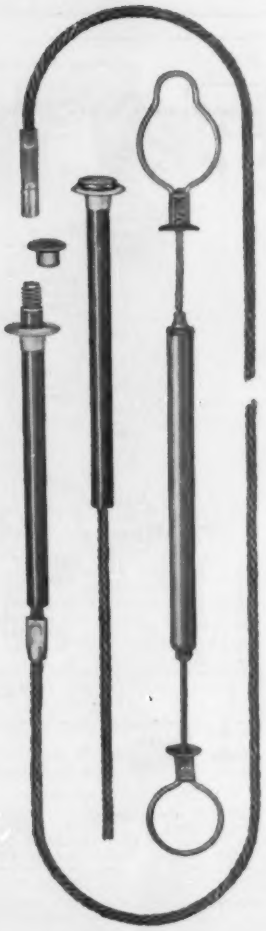
CHANCE F2 Cutout users get positive interruption at ANY fault current . . .



Utilities from coast-to-coast, impressed with the ruggedness and full range effectiveness of the Chance F2 Cutout, have written it into their standards. These utilities are sold on the F2's ability to protect their systems from *any* fault—HIGH, MEDIUM, or LOW (and points between) without damaging shock to procelain or fuse tubes. The F2 expandable cap and link ejector make this possible.

Chance F2 Cutouts, in voltages of 5.2, 7.8, 15 and 27 KV, and in 100 and 200 ampere ratings with interrupting capacities up to 12,000 amps, are available from local stocks. *They are also available in combination with lightning arrestors.*

A. B. CHANCE COMPANY, Centralia, Mo.
A. B. Chance Company of Canada, Ltd., Toronto CK60-24



. . . and Chance Fuse Links perform dependably at all values of fault currents

Precision-made to EEI-NEMA Interchangeability Standards, Chance K (fast) or T (slow) links are available from 1 to 200 amps with Universal Buttonheads, or as Universals with removable buttonheads and cable adapters, and from 1 to 50 amps in Open-Link style. They have extra-high strength, two-ply protecting tubes with an arc-quenching inner layer and a weatherproof outer layer. Cables are lead-coated for maximum resistance to corrosion.

The fusible elements of these fast or slow fuse links have the consistent melting characteristics needed to give dependable performance in any distribution cutout at all values of fault currents.

Chance Fuse Links are packaged in 5-unit, easily separated containers. Perforated ends on each container allow easy removal of link, even with gloved hands. Type and rating are clearly marked on both ends of each box.

Write for "Fuse Links and How To Use Them," a free manual on fuse link application and coordination.

COMING YOUR WAY

the Sangamo J3, the only meter with.....

TRUE MAGNETIC FLOTATION

THIS IS THE ONE, developed to meet your needs... THE SANGAMO SINGLEPHASE J3 WATTHOUR METER. This is the new and noteworthy development in watthour meters this year. One of the exceptional advances in metering in any year!

The moving system of the J3 is not supported or suspended. It floats, pure and simple, permanently and without friction, on a field created by magnets that are dimensionally and magnetically uniform. Stability is assured by the use of specially bonded Alnico in *all* magnetic components of the system. And, the J3 has these other *new* features:

A VISIBLE, SELF-CLEANING GAP that cannot be bridged by metal particles.

A CONTROLLED FLOATING SYSTEM for best performance on high loads. Side thrust is substantially reduced; tilt error is insignificant. These features combined with the unique slow speed of Sangamo J Meters, give you a moving system that is *guaranteed for life.*

ADVANCED INSULATION LEVEL for better protection and easier heat dissipation.

SMALLEST SIZE for easiest handling.

PLUS THESE TRADITIONAL SANGAMO ADVANTAGES: highest torque; slowest speed; lowest watt loss; sectionalized construction; corrosion-resistant finishes and materials; glaskyd base.

Your Sangamo Representative is coming your way with a sample of the J3. Become familiar with its "pluses". Then, plan to put it to work... for it has everything you want in a watthour meter. And that's a promise, for this is one of the really great ones.

true MAGNETIC flotation

J3

JM60-4

SANGAMO ELECTRIC COMPANY / SPRINGFIELD, ILL.

New utility equipment

Sangamo watthour meter

A new watthour meter, Type J3, has been introduced by Sangamo Electric Co., Springfield, Ill. The meter has a magnetic flotation system that supports the moving element, and practically eliminates friction and wear. Two cylindrical Alnico magnets, with opposing magnetic fields, float the rotating element on frictionless lines of magnetic flux. This "magnetic cushion," combined with upper and lower cobenium pivots and graphite rings that guide the element, holds the disk accurately in position even when the meter is installed at considerable degrees of tip or tilt.

Upper and lower endshake is controlled by Delrin thrust plates. Reg-

istration accuracy over the complete load range is assured by positive control of the rotating element under all load conditions. Dual Alnico damping magnets reduce unbalance substantially to make side thrust and tilt error insignificant.

Epoxy-coated current coils in the J3 meter provide improved insulation level and better heat dissipation. Even repeated surges at 2,000 amperes through current coils, and of 20,000 amps through neutral wire, will not alter registration beyond allowable limits of Standard MSJ10. Potential coil is encased in an acetate sheet to provide 10 kv rms insulation level and a safety factor in respect to the arc-gap flashover value of 4,500 volts. Potential coil characteristics of a 3-wire, 240 volt J3 are such that it can be used on 2-wire, 120 volt service.

Write U-701 on reply card, pg. 17

Transformer insulating paper

Moloney Electric Co., St. Louis 20, Mo., announces their new high temperature insulating paper "Duratherm" in distribution transformers. The basic transformer design has not been changed and high temperature oil will not be required.

Transformers having "Duratherm" insulation will have a 65 C kva rating in addition to the nominal 55 C kva rating. The 65 C rating will be 112 percent of the 55 C rating.

Moloney Electric Company feels, however, that the full benefit of this new insulation will be realized only when the utility industry has recommended ratings, loss ratios and operating practices.

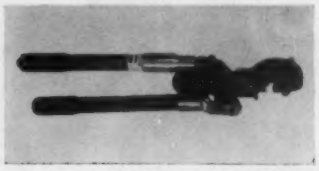
Write U-702 on reply card, pg. 17

Kearney compression tool

A new hydraulic compression tool available from the James R. Kearney Corp., St. Louis 10, Mo., now makes it possible to work compression connections hot on all wire sizes from #6 solid through 636 MCM ACSR.

Designated as the Kearney WH-2 Hydraulic Tool, the new tool is a portable, hand-operated hot-line compression tool designed to accommodate a wide range of connector and wire sizes. Die sizes include those now covered by the WH-1 Tool used extensively by many electrical utilities, plus the additional sizes required to install fittings on large conductors.

A two-step high speed pump exerts 21,000 pounds of thrust. An auto-



matic overload valve prevents overcompression. The C-frame head is larger than that of the WH-1 Tool, yet permits an unobstructed view of the work area while indents are being made. Only a partial turn of one handle is required to set the tool to compress or to instantly retract dies; there is no need to remove either hand from the operating handles.

Write U-703 on reply card, pg. 17

Preservative pole bandage

An envelope - type preservative bandage for on-the spot ground-line treatment of standing poles by line crews has been perfected by Chapman Chemical Co., Memphis, Tenn.

The Chapman Pol-Nu Pak consists of an improved, plastic-coated, kraft paper envelope with Chapman Pol-Nu, the original grease-type preservative, sealed inside.

Recommended for use as standard carry-along equipment on service

trucks, the Pol-Nu Pak permits any line crewman to apply ground-line treatment quickly and easily to individual poles requiring preservative protection.

The lineman excavates around the pole to an 18-inch depth, inspects and cleans the exposed pole area, slits the Pol-Nu Pak on three sides, and wraps the resulting bandage around the pole, stapling it in place. The hole is then backfilled to within two inches of the bandage top.

Write U-704 on reply card, pg. 17

Static type trip device

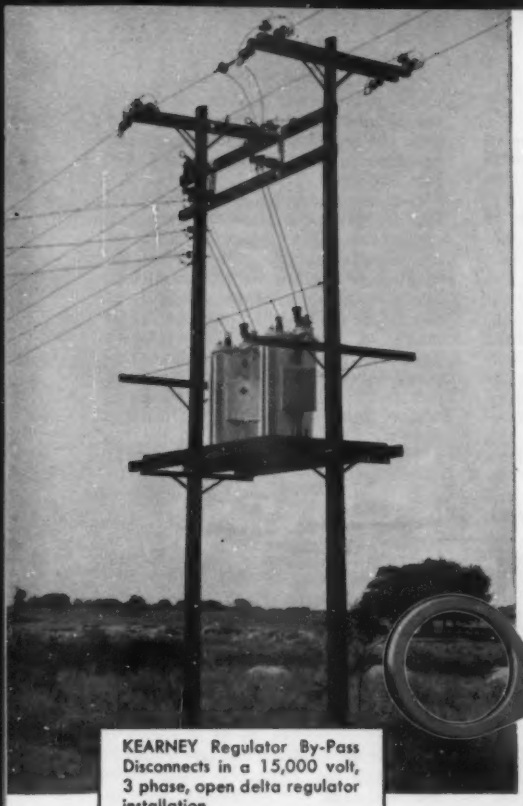
A NEW STATIC, auto-charge trip device that trips breakers on either dead or faulted power lines has been introduced as an optional accessory on metal-clad switchgear by General Electric Co., Schenectady 5, N. Y.

Major benefits of the new trip device include the elimination of a trip-

ping battery, the saving of space required by a tripping battery and reduced maintenance.

The unit provides tripping power to open breakers even after a prolonged power outage. It eliminates the need for low-energy, high-impact breaker tripping mechanisms since it will trip breakers having conventional mechanisms.

The auto-charge trip device requires minimum maintenance since it is a solid state design with each



KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

JAMES R. KEARNEY CORPORATION, *General Offices:* 4224-42 Clayton Avenue, St. Louis 10, Missouri

348

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

KEARNEY PRODUCTS

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The Mark of Quality

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

*Trademark

"Superforms* make my Budget Dollars go farther" ... PURCHASING AGENT

"We have to look at budgets as investments ... in terms of *return* . . . all the way from negotiating and pricing, to having equipment available when needed for use.

"With Fanner Superforms, we get *prompt quotations* from the Agent and the Factory . . . they *meet their commitments* . . . give *reliable service.*"

These are reasons why more and more Purchasing Agents are buying more and more Superforms. A-1805A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS... Protect long-span T&D lines at supports

LINEGUARDS... Protect short-span T&D lines at supports

PATCH RODS... Repair damaged conductors

TAP ARMOR... Protects conductor at tapping points

FANNGRIPS... For dead-ending strands and conductors

FANNSPLICES... Join two ends of conductor wire

PLASTIC PRODUCTS... For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc

element conservatively rated for maximum reliability.

All General Electric metal-clad switchgear using two-cycle breakers will be equipped to include the new auto-charge trip device.

Write U-705 on reply card, pg. 17

Oil switch spring operators

A powerful, portable spring operator provides fast, trip-free snap action for positive motion in switching from any position to the next in a new line of Snapact load-break oil switches announced by G & W Electric Specialty Co., Blue Island, Ill. Switching action is non-reversible and positive in the new line, increasing safety and reducing burning and pitting of contacts that could result

through hesitant or partial completion of manual throw or reverse of throw midway in operation.

Snapact spring operators are completely portable and weight only 25 pounds. One operator can be applied to any switch of any rating in the new line with no tools other than the wrench supplied with the operator for cocking it. The operator has no moving parts and is completely safe even if a cocked spring should be released in the hand.

The new SNAPACT load-break oil-switch line will carry and interrupt full 400-amp load current and is available in 5-, 7.5- and 15-kv ratings.

Write U-706 on reply card, pg. 17

115 kv mobile substation

A NEWLY-DESIGNED line of highway-type mobile substations and mobile transformers, offering among the highest kva and voltage ratings ever available for such units, has been announced by General Electric's Power Transformer Dept., 1 River Rd., Schenectady 5, N. Y.

A thorough study of every component of mobile equipment has resulted in significant weight reductions which now permit delivery of mobile substations rated as high as 20,000 kva, 115 kv. Mobile transformers can be obtained with ratings up to 40,000 kva, 138 kv.

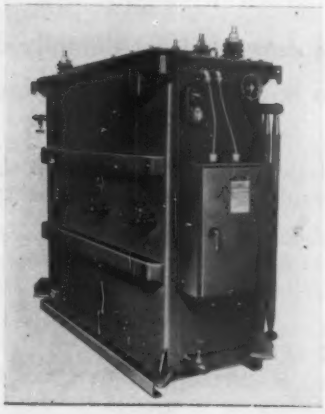
G-E engineers point out however, that in spite of the greatly increased capacity of the new mobiles, all units are designed to meet the highway dimensional limitations of practically every state in the nation. Weights of nearly all the mobile substations and many of the mobile transformers will also meet the restrictions imposed by most states. Special permits can usually be obtained in those cases where units exceed the permissible weight.

Write U-707 on reply card, pg. 17

Feeder voltage regulators

NEW, LOW-COST, feeder-voltage regulators (type SVR-FT) for use wherever a three-phase load is to be regulated to a desired voltage level are now offered by the Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa. The 60-cycle, three-phase, step-type regulators are rated 500 and 750 kva for 8.66, or 13.2-kv circuits.

These units are completely automatic and self-contained. Any voltage variation due to supply voltage change or variation due to load cir-

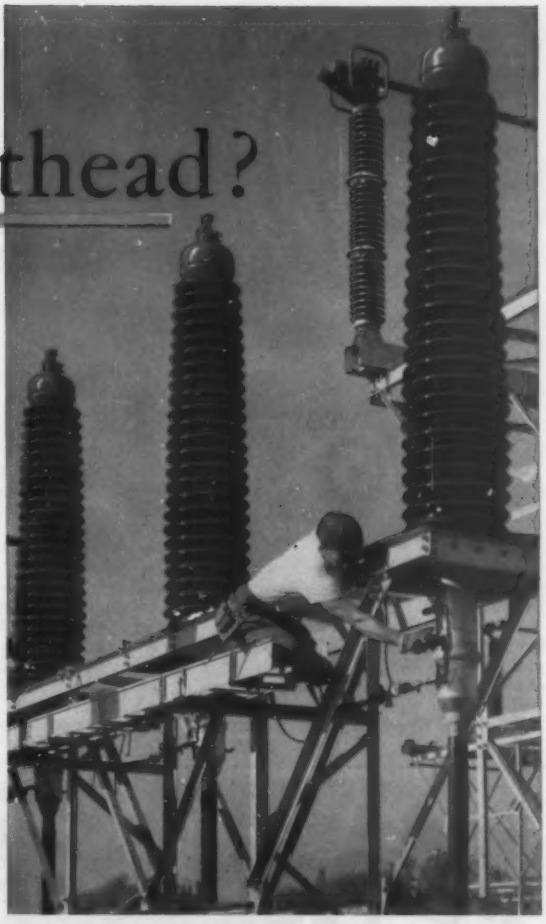


cuit change is detected by the control and the necessary correction made. As a result, no external equipment is needed for operation.

Some of the features of the new units include 16-step voltage regulation over a 20 per cent range. This results in fewer operations, an extension of contact life, a decrease in average error, and an increase in quality of regulation.

Also, a new type CVR relay incorporates both the voltage regulating device and time delay. This relay operates the tap changer mechanism, restoring the load voltage to normal when load-voltage fluctuations become too large for safe operation of industrial machinery. In addition to

What Is A Pothead?



Terminating a metallic sheathed or shielded cable creates an abrupt discontinuity in electrical characteristics of the cable. Electrostatic stresses that have been resolved by optimum balance of dielectric components within run of the cable itself are disturbed at a cable end when sheath and/or shielding are stripped away from the conductor insulation.

Rubber and plastic insulations exposed to the elements are subject to deterioration caused by sun, rain, industrial fumes, salt spray, and the like. Oil-impregnated paper insulation absorbs moisture readily, and if exposed to the atmosphere would soon cease to be an insulator. Creepage distance along the surface of insulation from bare conductor to ground becomes significant and can result in tracking and eventual flashover.

All these conditions are overcome by a pothead to the degree required by system design and BIL level desired. A pothead provides:

1. An hermetic seal of the cable end to prevent contamination of cable insulation by moisture or liquid dielectrics used in equipment to which the cables are connected.

2. An impervious porcelain insulator to protect cable insulation against weather and adverse contaminating atmospheric conditions.

3. Physical protection and mechanical support of the cable conductors, insulation sheath, armor, and so forth.

4. Means for making external electric connections with the cable conductors within the pothead housing.

5. A compact, economical housing providing adequate dielectric strength (including that of the cable end) considerably greater than can be accomplished by any other means within the same space.

Unlike a bushing, where characteristics are controlled by complete factory assembly and test of the whole device, the pothead manufacturer can provide in finished form only a portion of the whole termination. With a pothead termination, the cable, stress-relief cone, and dielectric compound must be assembled with the basic pothead in the field at time of installation. Successful operation of the termination requires proper combination of all these components.

Years of development work and of operating experience have resulted in a thorough understanding by G&W engineers of electrical and mechanical requirements for pothead terminations. From this has evolved the most complete line of pre-engineered standard potheads with improved gasket materials, superior porcelain designs, hermetically-tight metal-to-porcelain bonds, and an array of interchangeable pothead entrance fittings.

G&W knowledge of pothead-design fundamentals, use of materials of the highest grade, flexibility of component parts, and good installation techniques will help you make better cable terminations for more reliable transmission of electric power with underground cables.

G&W representatives welcome the opportunity to consult with you on your present and future cable-termination requirements. G&W's unique engineering service is available without obligation.

G&W ELECTRIC SPECIALTY COMPANY

3524 WEST 127th STREET • BLUE ISLAND, ILLINOIS

CANADIAN MFG. • POWERLITE DEVICES LTD. • TORONTO, MONTREAL & VANCOUVER

superior quality standards — inspired specialized design

A 60-1

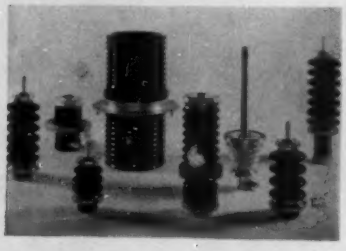
continuous monitoring of voltage in the system, this relay gives rapid correction of abrupt voltage changes and narrower effective bandwidth.

Write U-708 on reply card, pg. 17

Lapp solder-seal bushings

SOLDER-SEAL bushings designed for low voltage applications on hermetically sealed capacitors, test transformers and similar types of electrical equipment are announced by the Lapp Insulator Co., Inc., Le Roy, N. Y.

The new bushings have the advantage of being completely leak-proof,



with high mechanical and dielectric strength, and can be designed in a choice of shapes, sizes and ratings to fit a wide range of applications.

Bushings consist of a porcelain unit with a thin "fired-on" metal coating to which metal caps, flanges, and rings can be attached by soft solder techniques. The completed attachment is amazingly strong and permanent and will rupture the glaze from the porcelain before it will rip the metalized band from the glaze.

Bushings can be made to customer's design and specifications or can be designed and made by Lapp to meet specified characteristics. Bushings are supplied completely assembled and tested, ready for installation.

Write U-709 on reply card, pg. 17

SCW current transformer

Extension of its line of current transformers (Type SCW) to include a 900-kv BIL unit, highest voltage current transformer of its type ever built, has been announced by Allis-Chalmers, Milwaukee 1, Wis.

The oil-filled, hermetically-sealed, corona-free transformer is designed for heavy duty, accurate metering and relaying service.

Utilizing new insulation techniques and refinements in use of materials, the new transformer weighs about 60 per cent less than a conventionally built unit. Complete with oil, it is comparable in weight to a 250-kva distribution transformer.

*Trademark

Fine Fanner Superformed Products

"Superforms* are packaged for storeroom convenience" ...SUPERVISOR OF STORES

"The Fanner people understand our store-room problems.

"Their Superformed products are packaged right . . . well identified . . . easy to handle and store . . . don't get mixed up . . . are well catalogued . . . and, they arrive on time."

The thousands of items that must be stocked, and *readily available*, present a tough problem for Store Room Supervisors. Fanner recognizes this, and *cooperates!*

A-1282A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS... Protect long-span T&D lines at supports

LINEGUARDS... Protect short-span T&D lines at supports

PATCH RODS... Repair damaged conductors

TAP ARMOR... Protects conductor at tapping points

FANNGRIPS... For dead-ending strands and conductors

FANNSPLICES... Join two ends of conductor wire

PLASTIC PRODUCTS... For conductor surface protection

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It took 29 yrs. research to make

JAQUES Hydraulic HOLE DIGGERS

Fastest, Strongest, Safest most economical!

Jaques TJ-254 digging at 30-degree angle. Operates at up to 45 degrees.

Time-and-money-saving features of Jaques All-Hydraulic Hole Diggers took 29 years to develop. Rugged, versatile Jaques TJ-254 mounts on standard trucks, drills holes up to 48" diameter, to 25' depth, in hardest soil or rock — FASTER, CHEAPER, EASIER than competitive machines! Fewer moving parts insures ***minimum down-time, maintenance, operating costs.*** Shock-resistant device relieves strain in rock digging. Simple to operate with only 3 primary adjustments. FREE DEMONSTRATION WILL PROVE THESE CLAIMS!!

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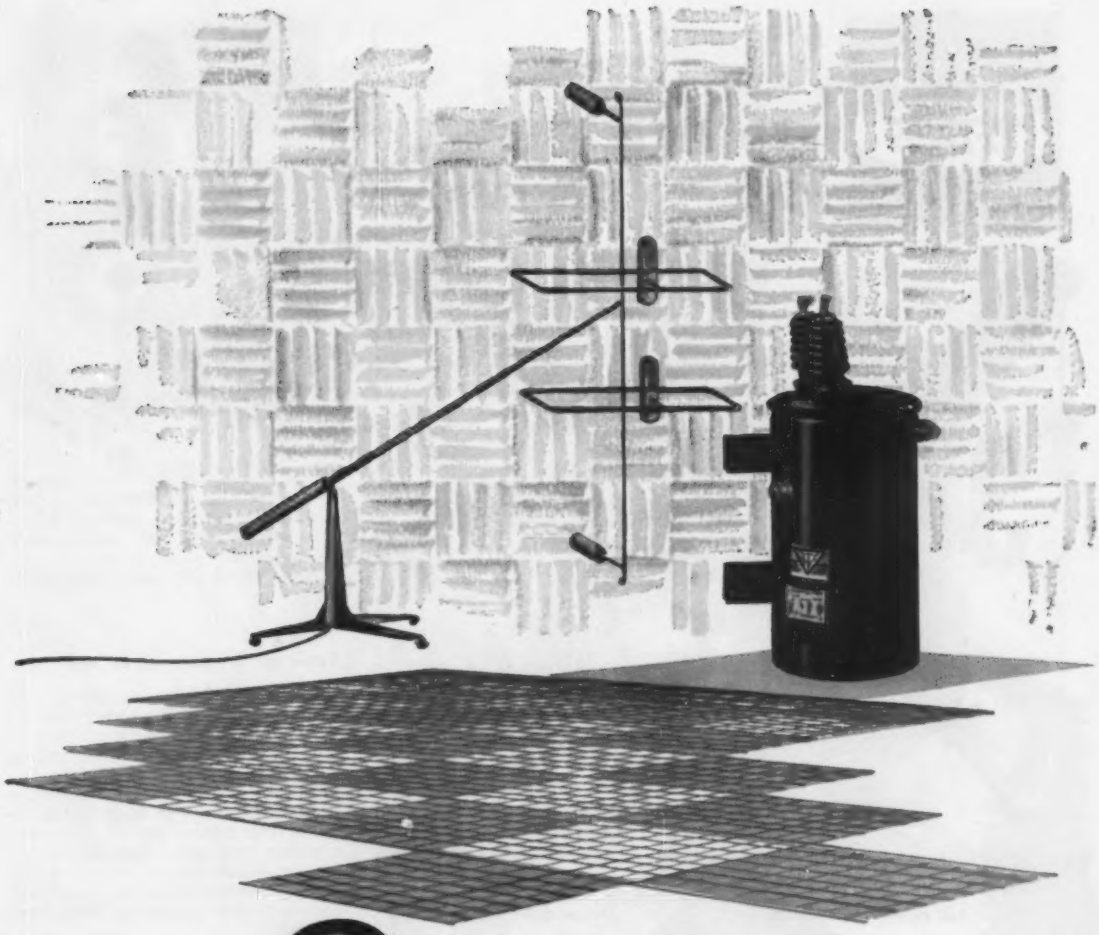


QUIET transformers assure satisfied customers. More-than-ordinary quietness is another outstanding feature of RT&E transformers. Normal noise is hushed, for full transformer life, by a unique core-clamping method that isolates the core and minimizes the transmission of sound vibration to the tank. By this method, operating noise is reduced to a point far below maximum db levels being considered by NEMA as standard for distribution transformers.

More proof that you buy more than just another transformer when you buy from RT&E.

RT&E CORPORATION

WAUKESHA, WISCONSIN
PORTLAND, OREGON
ARLINGTON, TEXAS

FF

Truco
DENVER

UNIVERSAL
TURRET DERRICK

YOU GET the derrick position you want when you buy Truco. Here are all the fine features of the famed Truco Turret Derrick now offered in your choice of three mounting positions for the job best suited to your truck body. Not only that, Truco offers full 360° rotation of the turret. You spot the load where you want it, dig the hole, set the pole with the positive safety and dependability of hydraulic operation.

- Unitized Construction
- Full 360° Rotation
- No Exposed Moving Parts
- 8,000 Pounds Capacity
- Digger Staws Automatically
- 30 Foot Sheave Height
- Adapts to Standard Line Bodies
- Optional 1-Man Fiberglass Basket

See your Truco dealer or representative for full details or write for illustrated literature.

TRUCK EQUIPMENT CO.
3963 WALNUT STREET / DENVER 5, COLORADO

First three of the new compact units are being shipped to the Missouri River Fort Randall Reservoir where they will operate on a 230-kv system.

Write U-710 on reply card, pg. 17

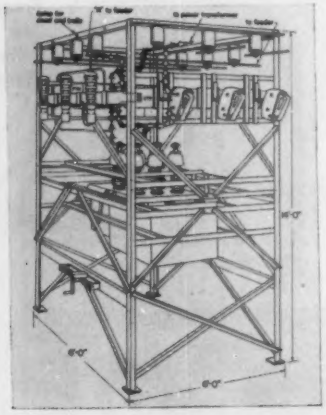
Recloser bypass structure

A new recloser bypass structure introduced by Westinghouse Electric Corp., Pittsburgh, Pa., is a complete package for the low-voltage side of a 15-kv distribution substation.

The structure includes a PR recloser with drawout contacts for disconnecting, bypass devices, lightning arresters and provisions for instrument transformers. It can serve as a dead-end structure for outgoing feeders since it is capable of 4000-pound loading.

All structural members are made of lightweight aluminum. The structure is shipped in two sections. To complete assembly, the upper section is bolted to the lower, and control and metering wiring installed.

Copper-tube bus is insulated with plastic sleeves to 110-kv BIL, and will handle 600 amperes continuously.



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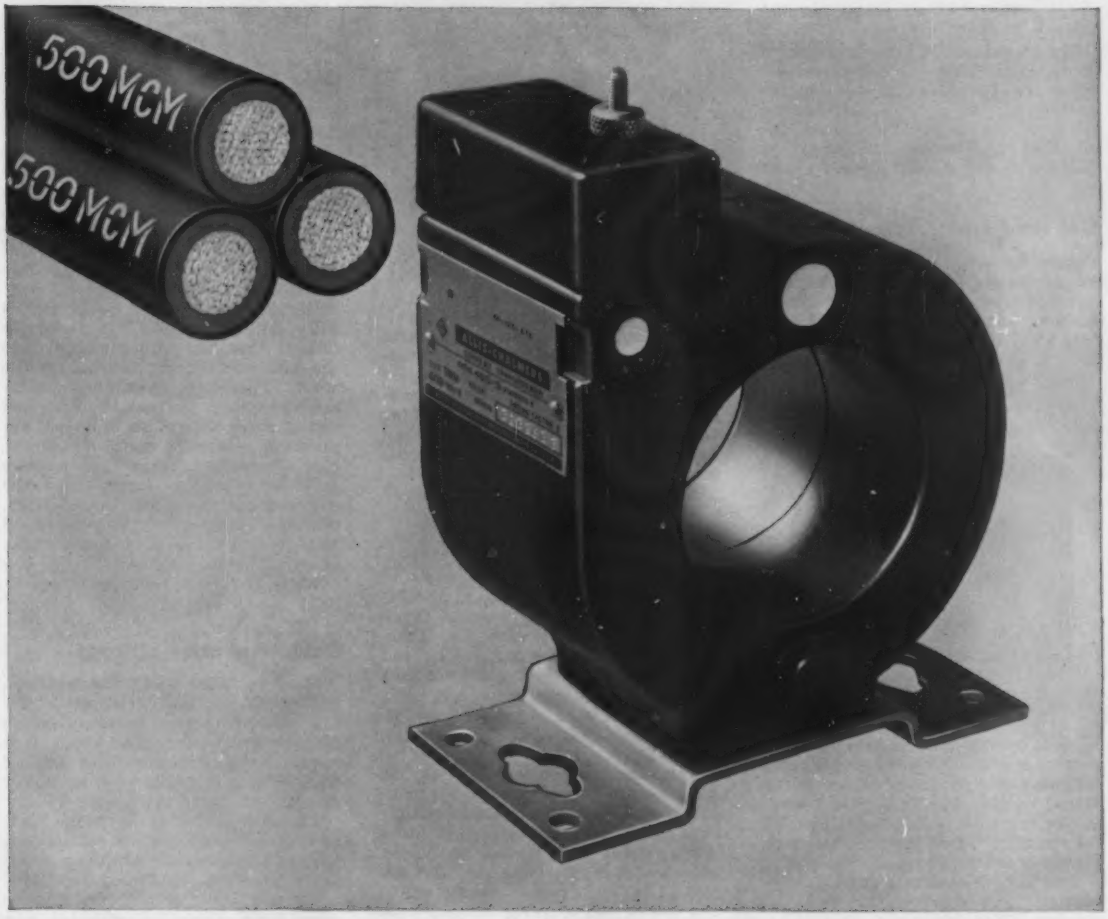


Lightest weight with largest window

and the best accuracy available on the market today

The NEW Allis-Chalmers "PICTURE WINDOW" current transformer can easily take three 500 MCM cables.

Compact, easy to install, indestructible and weatherproof — this 600-volt epoxy-resin transformer will withstand wide temperature variations and the most severe mechanical shocks. Eliminates all possible maintenance.

Easily adapted for conduit-type hookup, A-C current transformers can be used on 2 or 3-wire, single and polyphase circuits. Ratings: 200, 400, 600 and 800 amperes.

Get full details on this NEW TWM current transformer from your nearby A-C office. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1310

Verified accuracy! Certified test card accompanies every A-C unit shipped. This A-C design provides ample overcurrent capacity without reduction of accuracy.

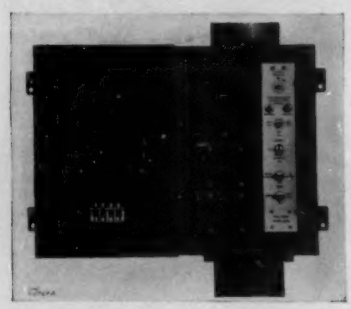
Bypass devices can be either disconnnect switches, fuse cutouts, or power fuses. Low-voltage lightning arresters are mounted on the outgoing bus. If required, a 5-kva distribution transformer can be mounted to provide 240 volts to operate the recloser motor mechanism.

The windless-type tank lifter is provided to lower the entire recloser from the operating level to a test position or to a base position for removal. The same lifter lowers the oil-filled tank for maintenance.

Write U-711 on reply card, pg. 17

L-M load transfer control

An improved three-phase control for automatic transfer of an important load from one distribution line to another, is now available from Line Material Industries, Milwaukee 1, Wis. This control, designated the Type S, features easy selection of



various operating sequences, enclosed relays, dead-front construction, and a hinged panel for quick access to internal wiring. The Type S is intended for use with L-M Type NR or VR oil switches, Type R or W reclosers, circuit breakers, or other switches.

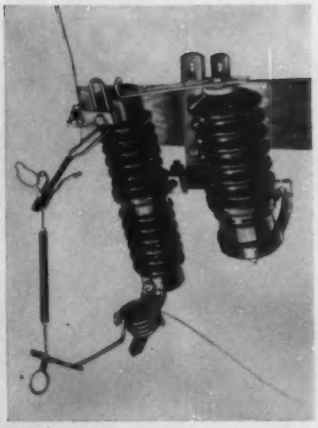
The Type S control is rated for operation from 60-cycle, 120-volt, a-c sources. Time-delay, provided to insure coordination with backup protective devices, ranges from 2 to 57 or 10 to 285 seconds.

A Type S control senses three-phase voltage on two sources and causes associated oil switches to transfer load from one source to another in the event any phase of the connected source fails.

Write U-712 on reply card, pg. 17

Open link cutout-arrester

A new 7.8 kv open link cutout is now available from A. B. Chance Co., Centralia, Mo., with a valve type lightning arrester to provide a low-cost, cutout-arrester combination for use on rural distribution lines. Long, dependable service can be assured by these two field-proven units, which have been thoroughly tested as a combination under both cutout and lightning arrester operating conditions.



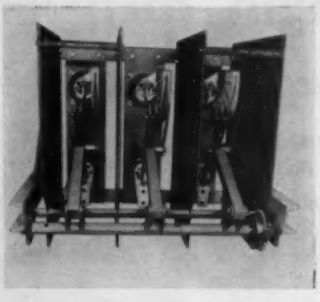
The big advantage of these rural-type cutout-arrester combinations is, of course, the cost savings over buying individual cutouts and arresters because of the single mounting bracket. In addition, they can be installed faster and more economically than individual units and they take up less space on the crossarm.

Write U-713 on reply card, pg. 17

Load-break switch

A new frame-mounted, manually-operated load-break switch (Type LBS) which incorporates the functions of a disconnecting switch and a circuit interrupter for interrupting transformer magnetizing and load currents has been announced by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

The new three-phase, single-throw, gang-operated switch with a quick-break blade and arc chute interrupter is available as an unfused or fused arrangement for housing in indoor cubicles. It is offered in ratings 4,800 and 13,800 volts capable of interrupting 400 or 600 amperes normal load, and momentary values up to 20,000 and 40,000 amperes respectively.



It can be provided with a direct-drive operator for side-of-cubicle mounting and a chain-drive operator for front of cubicle mounting. Available for both operators is a quick make mechanism provided for by powerful stored energy springs.

Both operators have provisions for padlocking the switch in either the full-open and full-closed positions. It is possible to mount one or two key interlocks to lock the switch open, closed, open-and-closed, or any combination of these three.

Write U-714 on reply card, pg. 17

Ohio Brass post insulators

At any given strength and electrical rating, a stack of O-B Unipost insulators is comprised of identical units. It is no longer necessary to deal with specialized top, bottom, or intermediate components during assembly. This time- and money-saving feature is one characteristic of the new Unipost, announced by Ohio Brass Co., Mansfield, Ohio.

Because each end of every unit is fully interchangeable, it naturally follows that any unit may fall into the full load-bearing location in the stack. Therefore, maximum assembly strength is present in every end cap of every unit. This universal application results in uniform bolt circles throughout, providing a base with as much as three times the conventional mounting area. High, uniform joint strength and broad base contact result in insulator stacks of exceptional stability.

Write U-715 on reply card, pg. 17

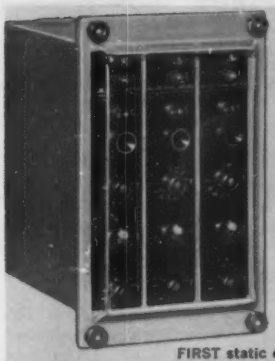
Cable insulation stripper

Hendrix Wire and Cable Corp., Milford, N. H., has developed a new tool to strip thermoplastic insulation from power transmission cable. It is expected to stimulate the use of high-density polyethylene as power distribution cable insulation.

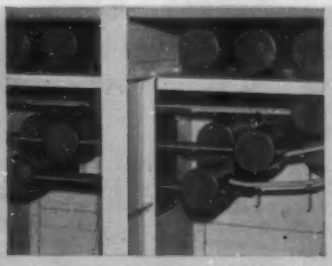
The same qualities that make high-density polyethylene an outstanding insulating material, abrasion resistance, strength, toughness and hardness, also make it difficult to strip from cable. However, with the new Hendrix tool, a lineman can strip hot-line cable in less than five minutes. It will remove 20/64 inches of insulation from conductor sizes No. 6 Awg. to 750,000 CM. The new tool also reduces time and effort required to strip rubber and other thermoplastic insulation.

Write U-716 on reply card, pg. 17

ALLIS-CHALMERS



FIRST static overcurrent relays



FIRST with track-resistant, glass polyester insulation with primary stud and bus joint

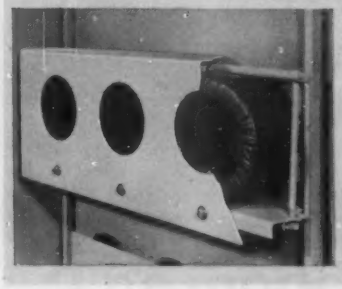
FIRST eye-level instrumentation switchgear

FIRST epoxy-resin potential transformers, trunnion mounted

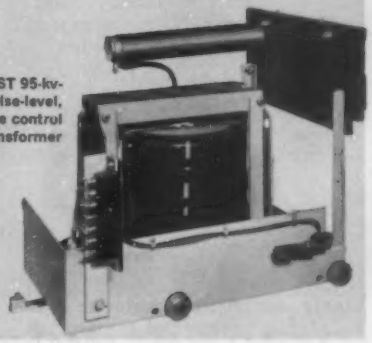
1ST

FIRST Aluma-Clad walk-in aisle switchgear

FIRST front-access current transformers



FIRST 95-kv-impulse-level, dry-type control power transformer



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There are still better things to come in switchgear. You'll get them all when you specify better switchgear... designed, built and *guaranteed* by **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin. A-1357

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Intradepartment teamwork bridges all gaps . . . smoothly integrates information, machines and men . . . speeding overall progress in Allis-Chalmers switchgear.

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers ✓

◆ IN THIS ISSUE, we begin discussion of Chapter 4 which is the last of the general applications chapters of the Code. Chapter 4 is concerned with "Equipment for General Use" and is divided into 10 Articles covering flexible cords, fixture wires, lighting fixtures, appliances, motors, generators, transformers, capacitors, resistors and reactors, and storage batteries.

Flexible cords

Flexible cord as defined in Article 400 is listed in sizes ranging from No. 27 tinsel and No. 18 other than tinsel to No. 2 by Table 400-9(b). Table 400-11 describes each type and its permissible uses. Section 400-2 states, "Cords of the several types shall conform to the descriptions of Table 400-11. Types of flexible cords other than those listed in Table 400-11 and other uses for types listed in the table, shall be the subject of special investigations and shall not be used before being approved." In other words, the cords listed cannot be used for uses and locations other than those listed for them in the table.

Section 400-3 indicates the uses permitted for cords, and Section 400-4 plainly states, "Flexible cord shall not be used (1) as a substitute for the fixed wiring of a structure; (2) where run through holes in walls, ceilings, or floors; (3) where run through doorways, windows, or similar openings; (4) where attached to building surfaces; or (5) where concealed behind building walls, ceilings, or floors."

Section 410-23 (c) states, "Exposed flexible cord or fixture wire shall not be used to supply permanently installed fixtures in show cases or wall cases." Section 400-5 states that cords shall not be spliced or tapped.

Fixture wires

Fixture wires, as defined by Article 402, have been used erroneously at times as part of the circuit wiring. Section 402-1, together with the fine print note following this section, leaves no doubt about the Code intent in this respect. This section states clearly that fixture wires are not to be used as branch circuit conductors nor for the connection of appliances. Fixture wires are to be used solely for wiring inside of fixtures to which the branch circuit conductors may be connected. Table 402-6 lists sizes from No. 18 to No. 14 together with other characteristics of the various types of fixture wires.

Lighting fixtures

Fixtures are required by Section 410-4 to be approved for the loca-

---

Code Test Questions

1. Lampholders installed over highly combustible material shall be of the unswitched type. True or false?

2. Fixtures shall be so installed that the connections between the fixture conductors and the circuit conductors may be inspected without requiring the disconnection of any part of the wiring, unless the fixture is connected by means of a plug and receptacle. True or false?

3. A recessed incandescent lamp fixture is not required to have the maximum allowable wattage marked on the fixture. True or false?

4. Solder is not permitted to be used in the construction of a recessed fixture box. True or false?

5. Display cases which are not permanently installed may have several grouped on a single secondary of an electrical discharge lighting circuit provided that the circuit is not overloaded. True or false?

6. Each electrically-heated appliance which is to be located in a fixed position:
   (a) May be placed against any wall.
   (b) Must have ½ inch clearance between itself and a combustible wall.
   (c) Shall be so placed as to provide ample protection between the appliance and adjacent combustible material.
   Which is correct? a? b? or c?

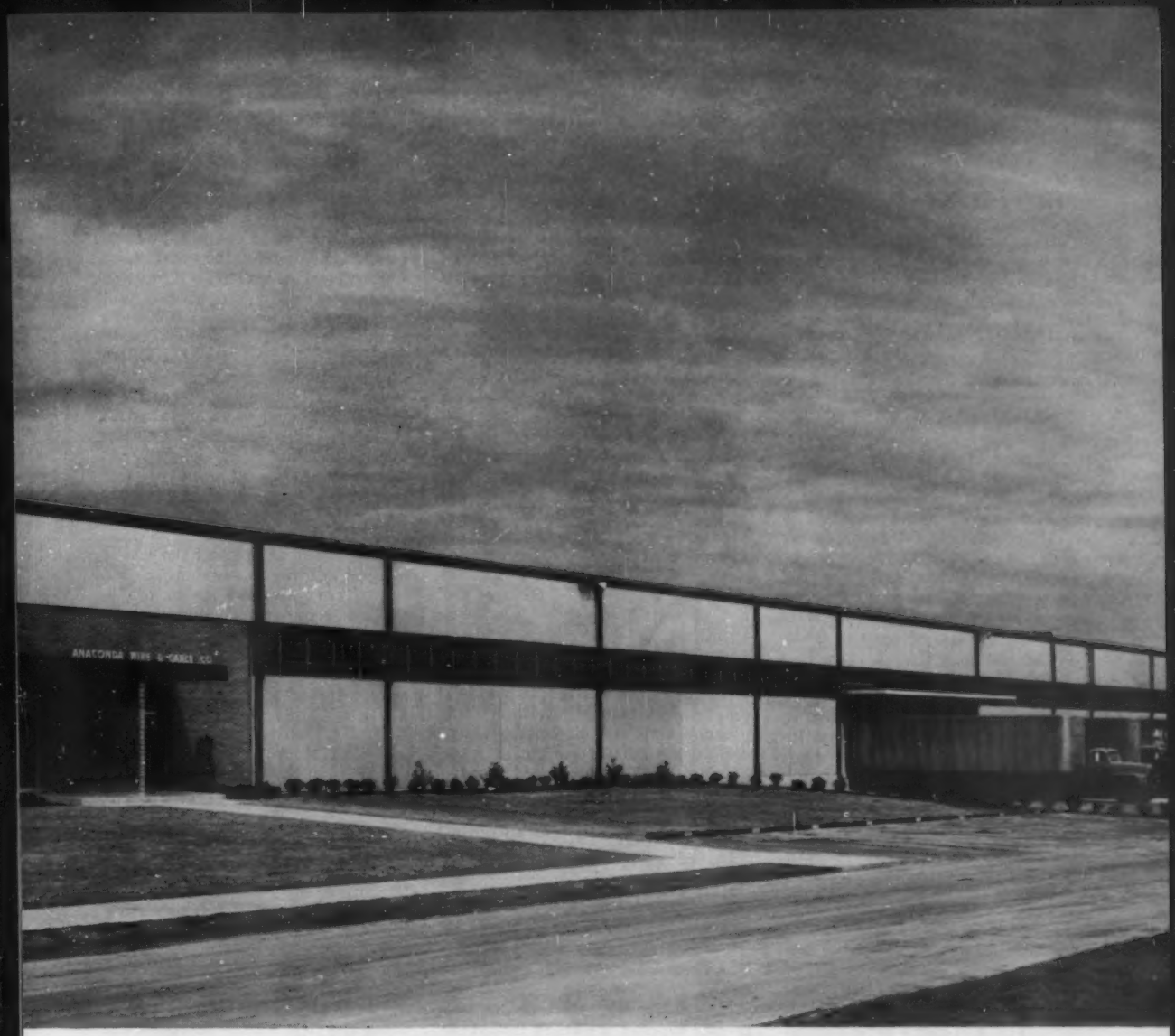
7. Infra-red lamp heating appliances shall have over-current protection:
   (a) not exceeding 50 amperes
   (b) not exceeding 70 amperes
   (c) not exceeding the rating of the appliance.
   Which is correct? a? b? or c?

8. The operating temperature of room surfaces where embedded heating cables are used shall not exceed the following temperature based on an ambient room temperature of 30° C.:
   (a) 50° C.
   (b) 66° C.
   (c) 90° C.
   Which is correct? a? b? or c?

9. Heating cables shall be separated from lighting fixtures and outlet boxes by not less than:
   (a) 4 inches.
   (b) 6 inches.
   (c) 8 inches.
   Which is correct? a? b? or c?

10. Adjacent runs of heating cable not exceeding 2-¾ watts per foot shall be installed not less than:
   (a) 1 inch on centers.
   (b) 1½ inches on centers.
   (c) 2 inches on centers.
   Which is correct? a? b? or c?

Correct answers may be found at end of article on page 119.



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We have served the South for many years, and we have been proud to share in this region's unprecedented growth.

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tion when installed in damp, wet, or corrosive locations. This section of the Code is violated frequently as one sees fluorescent fixtures which are suitable only for dry indoor locations, used outside in yards and gardens, mounted on the ground, with colored lamps reflecting on the shrubbery. Enclosed and gasketed fixtures which are approved for wet locations can be identified by the UL Label which states, "Underwriters Laboratories, Inc. Inspected, Enclosed and Gasketed Fixture." Several manufacturers make this type fixture.

Fixtures which are approved for circuit conductors running through the fixture, other than the conductors supplying the fixture, are marked "Fixtures Suitable for Use as Raceways." And unless so marked, they cannot be used as raceways.

Fixtures which are marked for use in other than dwelling occupancies may have voltages exceeding those permitted by the Code for dwellings.

Recessed fixtures which may reach temperatures in excess of 90° C are marked, "This fixture is suitable for installation only in buildings of fire-resistive construction, where the fixture is not mounted on or adjacent to combustible material." Recessed fixtures which attain but do not exceed temperatures of 90° C are marked to indicate the temperature rating of the supply conductors. No marking indicates that 60° C conductors are suitable.

Submersible fixtures which are mounted below the water surface, such as in swimming pools, are either wet-niche or dry-niche types. The wet-niche type can be serviced without lowering the water level. The dry-niche type are sealed in dry niches and can be serviced only after lowering the water level.

All of these, and the many more, UL markings are important in the selection of fixtures for various uses and locations. "Just any old fixture" won't always do.

Choosing recessed units

No fixture could be approved which would subject adjacent combustible material to temperatures exceeding 90° C. This includes recessed type fixtures. If a fixture is recessed in non-combustible material in a fire-resistive building, a temperature of 150° C is permissible if the fixture is approved for such service. But the maximum permissible temperature for most recessed fixtures in most buildings is 90° C.

If a recessed fixture will not exceed 60° C, then it may be connected directly to the branch circuit wiring. If it exceeds 60° C, the branch circuit wiring must have an insulation suitable for the temperature or terminate in a junction box at least one foot from the fixture. Wire of suitable temperature rating is then run from the box to the fixture. This wire must be not less than 4 feet and not more than 6 feet in length and must be in a suitable metal raceway.

Section 410-60 states, "Recessed portions of enclosures, other than at points of support, shall be spaced at least ½ inch from combustible material." Many electricians make the mistake of framing in for recessed fixtures without providing the ½ inch clearance all around as required by this section.

Except for the chain supported type, externally wired fixtures are not permitted in show windows. Pendants, or drop cords, are not permitted in clothes closets. Clothes closet lights are required to be installed over the door either on the wall or on the ceiling.

Some fixtures have pans which are larger than the outlet box. Section 410-13 states, "Any combustible wall or ceiling finish exposed between the edge of a fixture canopy or pan and an outlet box shall be covered with noncombustible material."

Supporting fixtures

A fixture exceeding 6 pounds in weight or 16 inches in any dimension is not permitted to be supported by a screw shell lampholder. Where the outlet box will provide proper support, a fixture should be attached thereto except that a fixture exceeding 50 pounds in weight is required to be supported independently of the outlet box.

Fluorescent fixtures which are supported independently of the outlet boxes are required to be connected to the boxes by metal raceways or armored cable except for cord-equipped fixtures which are suspended directly below the boxes, provided such cords are free from strain.

In many cases, incandescent lampholders are fitted with adapters and fluorescent fixtures are plugged into the old lampholders by means of portable cords. Section 410-41 states, "Lampholders of the screw-shell type shall be installed for use as lampholders only." And Section 410-52(a) states, "Receptacles installed for the attachment of portable cords shall be rated at not less than 15 amperes, 125 volts, or 10 amperes, 250 volts, and shall be of a type not suitable for use as lampholders."

Except for use in high-raised show windows, floor receptacles are required to be enclosed in floor boxes approved for the purpose.

Electrical discharge lighting equipment with an open-circuit voltage of more than 1,000 volts is not permitted to be installed in dwelling occupancies. If such equipment has an open-circuit voltage of more than 300 volts it is not permitted to be installed in dwelling occupancies ". . . unless such equipment is so designed that there shall be no exposed live parts when lamps are being inserted, or in place, or are being removed."

This does not prevent the use of outline lighting in residences such as for cove lighting up to 15,000 volts where the milliampere rating does not exceed 30 milliamperes as permitted by Section 600-32. But if the 30 milliampere rating is exceeded, the provisions of Article 410 apply.

Where fixtures containing ballasts are mounted on low-density cellulose fiberboard, they must be approved for the purpose or else have 1½ inches of air space between the fiberboard and the fixture. At the time of this writing, only one fixture, (manufactured by Gibson Mfg. Co., Atlanta, Ga.) has been approved for mounting directly on the surface of such low-density fiberboard. The Gibson fixture has only recently met the requirements for such approval, and it has the distinction of being the first fixture so approved.

Discharge lighting

For electric discharge lighting system with open-circuit voltages exceeding 1,000 volts, the fixtures must be controlled by externally-operable switches or circuit breakers which are within sight of the fixtures unless such switches or circuit breakers are capable of being locked in the open position.

Transformer ratings are limited to 15,000 volts, 120 milliamperes, or 7,500 volts, 240 milliamperes. Transformers must be of the enclosed type and be either of the dry type or Askarel filled type. Lamps connected to any transformer ". . . shall be of such length and characteristics as not to cause a condition of continuous overvoltage on the transformer."

Each fixture or secondary cir-

cuit of tubing of more than 1,000 volts is required to be marked in letters ¼ inch high showing the open-circuit voltage. Fixtures, transformers, and enclosures on circuits operating at more than 150 volts to ground shall be grounded. Fixtures of any voltage (above 50 volts to ground) shall be grounded if within 8 feet vertically or 5 feet horizontally of any plumbing or grounded surfaces.

Appliance rules

Wall-mounted ovens and counter-mounted cooking units are fixed appliances. Although they are permitted to be connected by means of a plug and receptable for ease in servicing, this plug and receptacle is not allowed to be used as the disconnecting means which is required for all appliances. A range, being portable, in that it can be moved to another premises, is permitted to have the plug and receptacle as the disconnecting means.

Any range or similar cooking unit is limited to a maximum demand of 70 amperes and a maximum size circuit of 50 amperes. If the demand when computed in accordance with Table 220-5 exceeds 70 amperes, the unit must be divided into more than one circuit, each not to exceed 50 amperes.

A motor driven appliance of over ⅛ hp is required to have a disconnecting means within sight of the motor controller or be of the type which can be locked in the open position.

Many inspectors complain that manufacturers are not complying fully with Section 422-21 which states, "Each electric appliance shall be provided with a nameplate, giving the maker's name and the normal rating in volts and amperes, or in volts and watts."

The maker's name is frequently displayed very prominently. But to find a listing of the volts and amperes or volts and watts often requires the removal of parts or covers which is objectionable to inspectors. Section 422-22 requires each individual heating element to be similarly marked where the appliance contains more than one such element, except that the maker's name is not required on each element. These individual rating markings are in addition to the total marking required for the appliance.

Heating cables

Heating cables for space heating systems are required to be in complete sizes or lengths as supplied by the manufacturer. Units which have been shortened or which have marking labels removed are not approved. At least 7 feet of non-heating leads are required to be furnished by the manufacturer for each unit of heating cable.

These leads are required to be marked within three inches of the end showing the manufacturer's name, or identification symbol, catalogue number, and rating in volts and amperes or watts. The lead wires must have a marking of red for 230 volts and of yellow for 115 volts. The non-heating leads are required to be run to a junction box with the markings visible in the box.

Excess lengths of cable must not be cut off but should be buried in the plaster so that the ends will just reach the junction box and leave 6 inches inside of the box.

Controllers and thermostats which have a position marked "off" must open all ungrounded conductors. If there is no "off" marking, they may open only one conductor. The disconnecting means must, of course, open all ungrounded conductors.

Wiring above a ceiling which contains heating cable is required to be not less than 2 inches above the heated ceiling. If such wiring is either within thermal insulation or if it is in a joist space above a heated ceiling which contains no thermal insulation, the wiring must be considered to be operating in an ambient temperature of 50° C. Such conductors must therefore be de-rated in accordance with temperature correction factors listed in Tables 310-12 and 310-14. Wiring which is above thermal insulation of at least 2 inches in thickness requires no correction for temperature. See Figure 1.

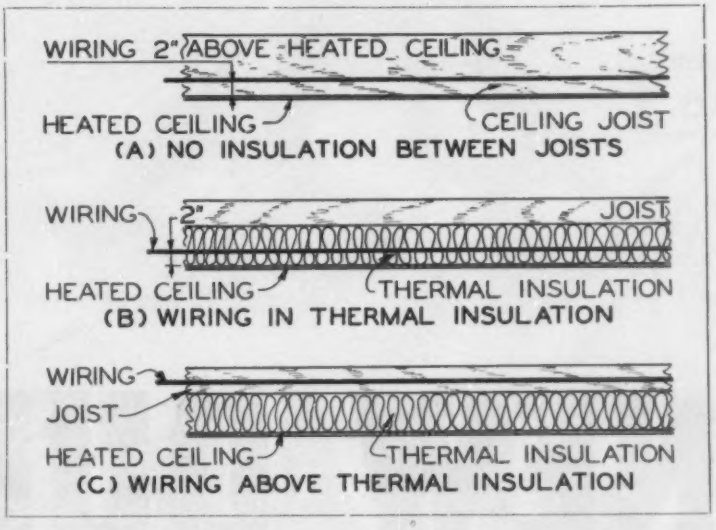

Fig. 1—Wiring is required to be a minimum of 2 inches above ceiling heat installations. If there is no thermal insulation, as at (A), wiring must be considered as being in an ambient temperature of 50° C and derated in accordance with Code Tables 310-12 and 310-14. If wiring is run within thermal insulation, as at (B), it must still be a minimum of 2 inches above heated ceiling and must be considered as being in ambient temperature of 50° C and derated accordingly. Wiring run above insulation, as at (C) need not be derated.

Wiring in walls is required to be placed outside of the thermal insulation if in outside walls. Wiring in interior walls must be kept away from heated surfaces and considered as operating in an ambient temperature of 40° C. Such conductors must be derated in accordance with temperature correction factors listed in Tables 310-12 and 310-14.

Heating cables are not permitted to be installed inside of walls. They are permitted to be fastened only to the surface and ". . . may be applied only to gypsum board, plaster lath and similar fire resistant materials. With metal lath or other conducting surfaces, a coat of plaster (brown or scratch coat) shall be applied to completely cov-

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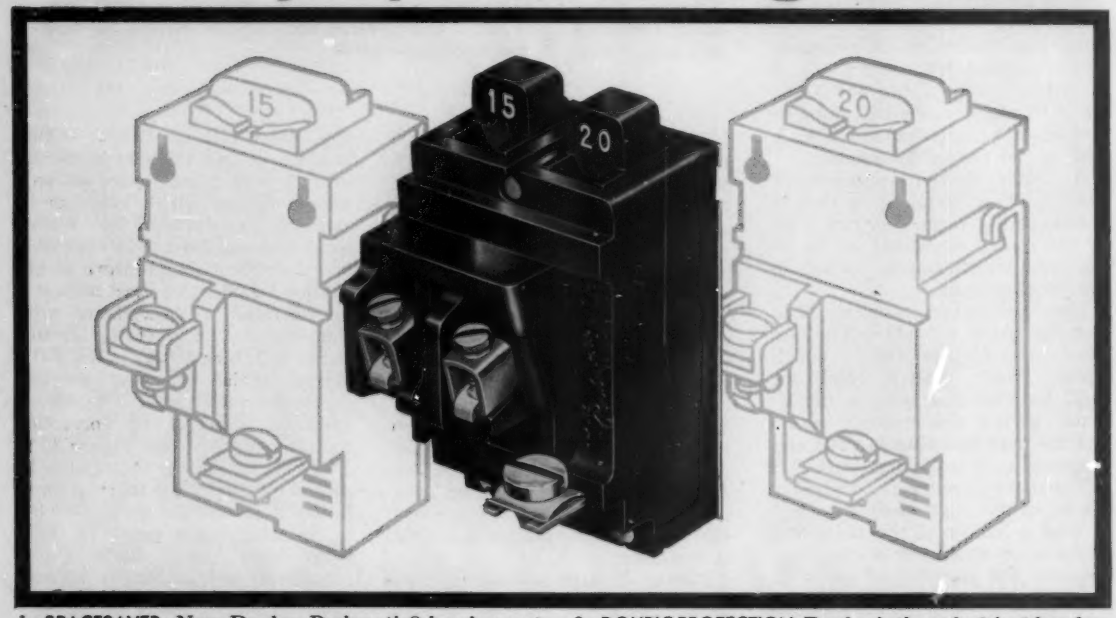
NEW DUPLEX

The only space-saving breaker



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2. DOUBLE PROTECTION. Duplex is the only 2-in-1 breaker that gives coil-magnetic short-circuit protection, as well as thermal overload protection, for each circuit. Provides identical, independent coil protection in each pole.

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Standard Electric Mfg. Company
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Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
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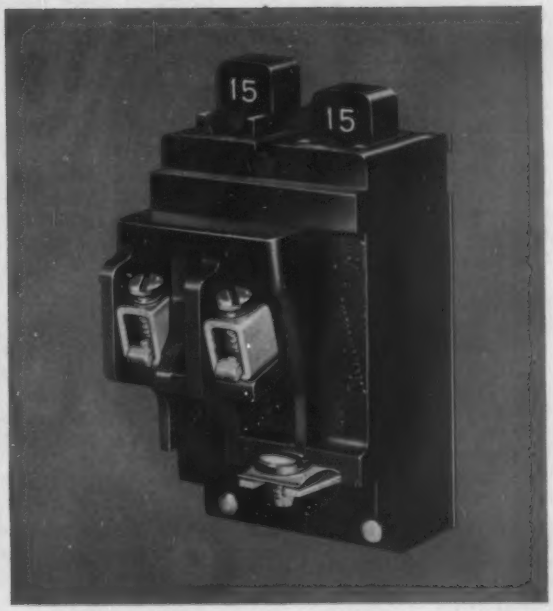
3. ONE BOLTED CONNECTION. Duplex provides a single positive bolted connection to bus bar. Electrical contact is under constant pressure, won't work loose, won't overheat. Installation is quick and easy.



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BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

er the metal lath or conducting surface before the cable is attached."

When applied to ceilings "The entire ceiling surface shall have a finish of thermally non-insulating sand plaster or other approved non-insulating material having a nominal thickness of ½ inch."

For dry board installations, ". . . the entire ceiling shall be covered with gypsum board not exceeding ½ inch thickness. The void between the upper layer of gypsum board and the surface layer of gypsum board shall be filled with thermally conducting plaster or other approved material."

The non-insulating sand plaster and the thermally conducting plaster refers to plasters capable of

(Continued on page 119)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.)

Code requirements for direct burial cable

QUESTION: I would like to know if Section 515-5(a) could be interpreted to cover all underground direct burial cable. There is no other article or section that specifies a minimum depth for this type cable. However, in our section, we require a two foot minimum depth, with one of the several methods as set out in other sections of the NEC for additional protection.

ANSWER: No. Section 515-5(a) has to do with underground wiring in certain areas of bulk-storage plants only. Most inspectors require a minimum of 18 inches below the surface for direct burial wires and cables depending upon the circumstances and upon the protection needed. This section of the Code, however, cannot be used as the basis for any general minimum burial depths for direct burial cable.

Lighting equipment for spray booths

◆ A RECENT QUESTION in this section asked, "Is it permissible to use fixed lighting and portable lighting in paint spray booths or rooms? If so, what type may be used?"

The published answer to this question (Page 148, April 1960 issue) indicated that the Code does forbid portable lighting in such areas, but permits use of fixed lighting fixtures approved for Class I locations.

This answer has led to considerable discussion with other creditable Code authorities who believe that such fixtures are *not* permitted by the Code in such spray areas where they may be subject to hazardous accumulations of readily ignitible deposits or residues. These authorities point out that Article 516, on Finishing Processes, deals with two different hazards: flammable vapors, and readily ignitible deposits and residues. They direct attention to the fact that the first paragraph of Section 516.2 points out that that section deals with the hazard of flammable vapors, while ignitible deposits and residues are covered in Section 516.3.

The point of difference hinges largely on the definition of the word "location" in Section 516.3 (b) which reads, "Unless specifically approved for the location, no electrical equipment shall be installed or used where it may be subject to hazardous accumulations of readily ignitible deposits or residues . . ." The author of the original answer feels strongly that the location is Class 1, Division 1, since Section 500.4(a) so defines spray booths and areas in the vicinity of spraying and painting operations. However, those that hold a different point of view believe that this "location" used in Section 516.3(b) means a location where equipment would be subject to hazardous accumulations of readily ignitible deposits or residues; and that the lighting fixtures would have to be of a type approved for that type location *in addition* to being Class 1, Division 1 fixtures.

This latter view is supported by NBFU Special Pamphlet No. 33 on the subject of spray finishing. The July 1959 edition of this pamphlet states, (Par. 405) "Unless specifically approved for locations containing both deposits of readily ignitible residue and explosive vapors, there shall be no electrical equipment in any spraying area . . ." This is followed by an explanatory note reading, "410.(2) From the above Section 405 it will be noted that in general electrical equipment is not permitted inside any spray booth . . . unless such equipment is specifically approved for both readily ignitible deposits and flammable vapor. At present, no such equipment is approved by a nationally recognized laboratory . . ."

NFPA releases Code information

◆ THE ELECTRICAL Code Committee of the National Fire Protection Association has recently released two important items—an official interpretation of a section of the Code and a tentative interim amendment of the 1959 edition of the Code.

The interpretation, developed through the established committee procedure in response to requests, has been reviewed and released by the NFPA Electrical Correlating Committee.

Subject of the interpretation is two-fold and concerns (1) the use of service entrance cable without individual insulation on the grounded conductor; and (2) location of a 3-wire service entrance cable. The official text of the interpretation follows:

Interpretation No. 461

Question No. 1—Would the use of service entrance cable without individual insulation on the grounded conductor installed from main disconnect and overcurrent units (outside of building) to feed a 3-wire, 120/240-volt lighting and appliance branch circuit panel located 40 feet inside of building be in compliance with Section 338-3?

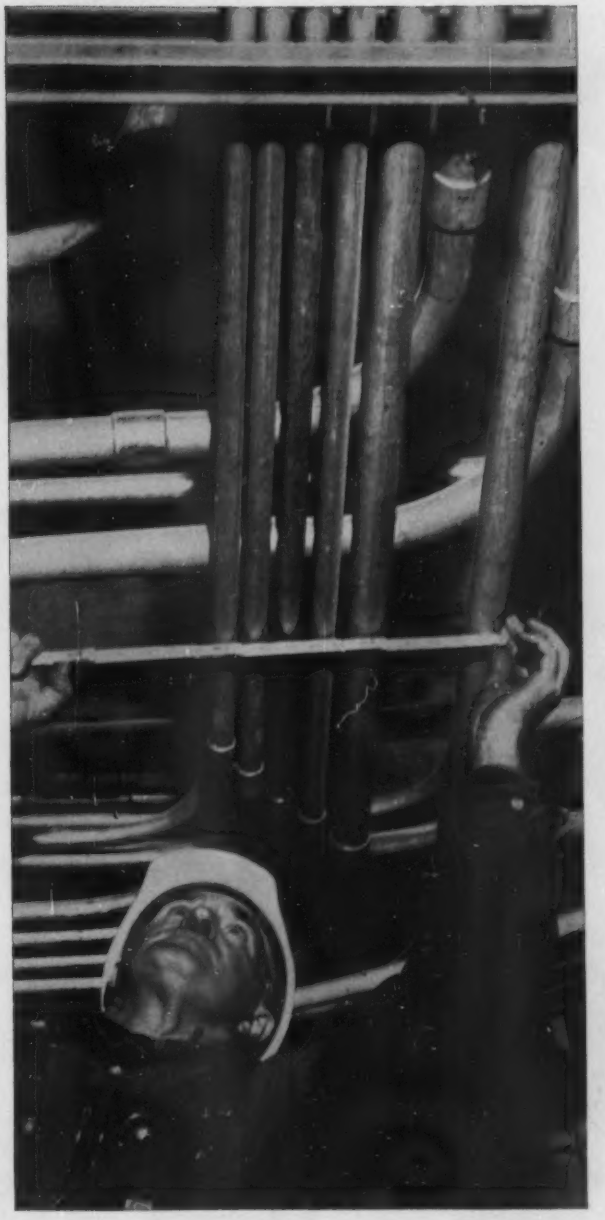
Answer: No.

Question No. 2—A building has a 3-wire, 120/240-volt service drop attached to the front of building. If an electrician installed a 3-wire service entrance cable from the service drop through the attic and down inside of the back wall of the building to feed the service equipment, would this be in accordance with Section 230-70b, 230-91, and the note following Section 230-44 of the 1959 National Electrical Code?

Answer: No.

Interim amendment

The tentative interim amendment to the 1959 edition of the National Electrical Code, No. 113, which became effective April 22, 1960, concerns recognition of two classifications of fuses, 601-800 and 801-1200, instead of the one classification of 601-1200, as now given in the Code. The change appears in Section 240-23(a)(2).



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New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

LEAD SHEATHED CABLE (IN CONDUIT)
THREE CONDUCTOR

NO. CABLES PULLED, 1-2

CABLE SIZE	HOURS PER "M" FT.	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
12	7.2	.014	.016	.018	.02	.022	.023	.025	.027	.029	.031	.032
10	11.4	.023	.026	.029	.031	.034	.037	.04	.043	.046	.048	.051
8	13.3	.027	.03	.033	.037	.04	.043	.047	.05	.053	.057	.06
6	18.8	.038	.042	.047	.052	.056	.061	.066	.071	.075	.08	.085
4	24.2	.048	.054	.061	.067	.073	.079	.035	.091	.097	.103	.109
2	34.3	.069	.077	.086	.094	.103	.111	.12	.129	.137	.146	.154
1	38.3	.077	.086	.096	.105	.115	.124	.134	.144	.153	.163	.172
1/0	44.8	.09	.101	.112	.123	.134	.146	.157	.168	.179	.19	.202
2/0	51.4	.103	.116	.129	.141	.154	.167	.18	.193	.206	.218	.231
3/0	57.9	.116	.13	.145	.159	.174	.188	.203	.217	.232	.246	.261
4/0	68.3	.137	.154	.171	.188	.205	.222	.239	.256	.273	.290	.307
250 MCM	76.0	.152	.171	.19	.209	.229	.247	.266	.285	.304	.323	.342
300 "	86.2	.172	.194	.216	.237	.259	.28	.302	.323	.345	.366	.388
350 "	94.6	.189	.213	.237	.26	.284	.307	.331	.355	.378	.402	.426
400 "	102.9	.206	.232	.257	.283	.309	.334	.36	.386	.412	.437	.463
500 "	116.8	.234	.263	.292	.321	.35	.38	.409	.438	.467	.496	.526

E-101-B

LABOR: INCLUDES PREPARATION TIME, INSTALLING PULL WIRE ON RUNS OF 75 FT. AND UNDER, SETTING UP REELS, PULLING CABLE. (DOES NOT INCLUDE MAKING UP JOINTS, RACKING IN UNDERGROUND VAULTS OR INSTALLING FITTINGS AT ENDS OF CABLES LARGER THAN NO.2)

7-60

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LEAD SHEATHED CABLE (IN CONDUIT)
THREE CONDUCTOR

NO. CABLES PULLED - 3

COND. SIZE	HRS. "M" PT.	LABOR COST INSTALLED PER PT. AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
10	13.1	.026	.029	.033	.036	.039	.043	.046	.049	.052	.056	.059
8	15.4	.031	.035	.039	.042	.046	.050	.054	.058	.062	.065	.069
6	21.6	.043	.049	.054	.059	.065	.07	.076	.081	.086	.092	.097
4	27.8	.056	.063	.07	.076	.083	.09	.097	.104	.111	.118	.125
2	39.5	.079	.089	.099	.109	.119	.128	.138	.148	.158	.168	.178
1	44.0	.088	.099	.11	.121	.132	.143	.154	.165	.176	.187	.198
1/0	51.6	.103	.116	.129	.142	.155	.168	.181	.194	.206	.219	.232
2/0	59.0	.118	.133	.148	.162	.177	.192	.207	.221	.236	.251	.266
3/0	66.7	.133	.15	.167	.183	.20	.217	.233	.25	.267	.283	.30
4/0	78.4	.157	.176	.196	.216	.235	.255	.274	.294	.314	.333	.353
250 MCM	87.5	.175	.197	.219	.241	.263	.284	.306	.328	.35	.372	.394
300 "	99.1	.198	.223	.248	.273	.297	.322	.347	.372	.396	.421	.446
350 "	108.8	.218	.245	.272	.299	.326	.354	.331	.408	.435	.462	.49
400 "	119.0	.238	.268	.298	.327	.357	.387	.417	.446	.476	.51	.54
NO. CABLES	PULLED											
10	14.1	.028	.032	.035	.039	.042	.046	.049	.053	.056	.06	.063
8	16.3	.033	.037	.041	.045	.049	.053	.057	.061	.065	.069	.073
6	23.1	.046	.052	.058	.064	.069	.075	.031	.087	.092	.098	.104
4	29.7	.059	.067	.074	.082	.089	.097	.104	.111	.119	.126	.134
2	42.3	.085	.095	.106	.116	.127	.137	.148	.159	.169	.18	.19
1	47.0	.094	.106	.118	.129	.141	.153	.165	.176	.188	.20	.212
1/0	55.1	.11	.124	.138	.152	.165	.179	.193	.207	.22	.234	.248
2/0	63.2	.126	.142	.158	.174	.19	.205	.221	.237	.253	.269	.284
3/0	71.2	.142	.16	.178	.196	.214	.231	.249	.267	.285	.303	.32
4/0	84.0	.168	.189	.21	.231	.252	.273	.294	.315	.336	.357	.378

E-102-B LABOR: INCLUDES PREPARATION TIME, INSTALLING PULL WIRE ON RUNS OF 75 FT. AND UNDER, SETTING UP REELS, PULLING CABLE. (DOES NOT INCLUDE MAKING UP JOINTS, RACKING IN UNDERGROUND VAULTS OR INSTALLING FITTINGS AT ENDS OF CABLES LARGER THAN NO.2)

7-60

LEAD SHEATHED CABLE (OPEN UNDERGROUND)
ONE CONDUCTOR

CABLE SIZE	HOURS "M"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
12	2.6	.005	.006	.007	.007	.008	.009	.009	.01	.01	.011	.012
10	4.1	.008	.009	.01	.011	.012	.013	.014	.015	.016	.017	.018
8	4.8	.01	.011	.012	.013	.014	.016	.017	.018	.019	.02	.022
6	6.6	.013	.015	.017	.018	.02	.022	.023	.025	.026	.028	.03
4	8.3	.017	.019	.021	.023	.025	.027	.029	.031	.033	.035	.037
2	11.9	.024	.027	.03	.033	.036	.039	.042	.045	.048	.051	.054
1	13.0	.026	.029	.033	.036	.039	.042	.046	.049	.052	.055	.059
1/0	15.1	.03	.034	.038	.042	.045	.049	.053	.057	.06	.064	.068
2/0	17.2	.034	.039	.043	.047	.052	.056	.06	.065	.069	.073	.077
3/0	19.4	.039	.044	.049	.053	.058	.063	.068	.073	.078	.082	.087
3/0	22.6	.045	.051	.057	.062	.068	.073	.079	.085	.09	.096	.102
250 MCM	24.0	.05	.056	.062	.068	.075	.081	.087	.093	.10	.106	.112
300 "	28.0	.056	.063	.07	.077	.084	.091	.098	.105	.112	.119	.126
350 "	30.5	.061	.069	.076	.084	.092	.099	.107	.114	.122	.13	.137
400 "	33.0	.066	.074	.083	.091	.099	.107	.116	.124	.132	.14	.149
500 "	37.1	.074	.083	.093	.102	.111	.121	.13	.139	.148	.158	.167
600 "	40.5	.081	.091	.101	.111	.122	.132	.142	.152	.162	.172	.182
700 "	43.8	.088	.099	.110	.120	.131	.142	.153	.164	.175	.186	.197
750 "	45.3	.091	.102	.113	.125	.136	.147	.159	.17	.181	.193	.204
800 "	46.8	.094	.105	.117	.129	.14	.152	.164	.176	.187	.199	.211
900 "	49.2	.098	.111	.123	.135	.148	.16	.172	.185	.197	.209	.221
1000 "	51.8	.104	.117	.130	.142	.155	.168	.181	.194	.207	.22	.233

E-102-B

Labor: INCLUDES PREPARATION, SET UP OF REEL, STRINGING CABLE (NO EXCAVATION, TAPS OR CONNECTING TO ENCLOSURE)

7-60

Electrical Estimating—III

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Know the law

by Arthur L. H. Street

Employers not always liable for injuries

The problem: The mutual responsibility of master and journeyman electricians for accidental injuries to the latter on the employer's premises was indirectly involved in a case decided by the Arizona Supreme Court, where a railroad roundhouse electrician was injured while adjusting equipment on top of a locomotive boiler. He allegedly fell due to a slippery condition of the surface on which he was working. Was the employer liable?

Court's answer: No. The Arizona Supreme Court upheld the trial court's order dismissing the suit, on a jury's verdict in favor of the employing railway company. The jury had been properly told by the trial judge, in effect, that the employer was not liable if the injury resulted, not from negligence, but from a happening in circumstances which it could not avoid in the operation of its business, if (a) the employee knew and appreciated those circumstances, and (b) they were not so dangerous that the employee could not, by exercising reasonable care for his own safety, avoid the injury. (Hoge v. Southern Pacific R.R. Co., 339 Pac. 2d 393.)

Obviously, the liability of a master electrician should be tested by the same rule of law for similar accidents occurring on his premises.

Municipal licensing ordinance upheld

The problem: Petitioner, a Florida master electrician, was licensed to conduct his business in four nearby cities and towns. A fifth town, Dania, had a licensing ordinance but its officials refused to issue a license to petitioner. He sued to require issuance of a license to him, asserting that an ordinance requiring applicants to take and pass an examination given by a municipal board was unconstitutional.

Because petitioner failed to show that he had offered to pay the license fee imposed by the ordinance, the court refused to compel issuance of a license. The petitioner then so amended the petition in the suit as to show that payment of the license fee had been tendered; and sought only to compel the issuance of a certificate of competency as a master electrician by the municipal board of examiners but did not seek to compel the issuance of an occupational license, which, he could not do as the examining board did not have the authority to issue a license.

Alleges unconstitutionality

In the amended petition, the petitioner based his right to the certificate of competency on the alleged unconstitutionality of the examination portions of the ordinance and upon petitioner's showing that he was a qualified licensed master electrician in Fort Lauderdale, Pompano Beach, Boca Raton, and Deerfield Beach.

Court's answer: The court dismissed the amended petition and petitioner unsuccessfully appealed to the Florida District Court of Appeal, Second District. The higher court decided that even if the ordinance requiring a license was unconstitutional—a point not decided—petitioner was not entitled to compel the examining board to issue to him a certificate of competency without his taking an examination or seeking a license, which the examining board had no power to issue. (Dance v. City of Dania, 114 So. 2d 697)

The Court of Appeal said that petitioner could not seek to compel the examining board to issue a certificate of competency under an ordinance which he claimed was unconstitutional; the legal existence of the board being dependent upon the validity of the ordinance.

Here are the principal features of the ordinance involved:

"Examinations shall commence on the day designated and continue until all applicants appearing for the examination have been examined and shall be based on questions designed to determine the applicant's practical knowledge of electrical construction as defined in this ordinance and may be wholly or part in writing.

"Examinations shall be of a technical nature and sufficiently strict to satisfy the board as to the applicant's competence in the field of his application as well as his familiarity with the rules and regulations governing electrical construction.

"Applicants who pass the examinations will be issued a certificate of competency by the board of examiners. All such certificates shall expire on the ensuing October 1st, and may be renewed at that time by the board. If more than 30 days has expired since the expiration date of a master's certificate, said license will not be renewed unless reapproved by the board of electrical examiners, subject to the penalties."

Material supplier's rights on federal job

The problem: The federal statutes known as the Miller Act give subcontractors and material suppliers claims against the prime contractor and his bondsman on federal construction projects. One condition imposed upon claimant is that he give timely notice to the prime contractor of his claim. In the case under study, there were two related corporations, Vee Jay Electric Co., Inc., a New York corporation, and Vee Jay Electric Company of Delaware, Inc. The prime contractor on a federal gymnasium building job sublet the electrical work to the New York corporation and other unrelated work was let to the Delaware corporation. The Dover Electric Supply Co., Inc., furnished the materials needed by the New York company, but in filing notice of its claim inadvertently stated that the materials had been furnished to the Delaware Company. Did that mistake invalidate the claim?

Court's answer: No. So decided the United States District Court, District of Delaware, in the case of Dover Electric Supply Co. v. Leonard Pevar Co., 178 Fed Supp. 834.)

(Continued on page 118)

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News of the industry

edited for Southern readers

Duke Power offers plan for leadership studies

THIRTY-SIX participants in Duke Power Company's "home grown" management development program have completed a three-stage course in subjects ranging from basic economics to effective communication.

The program, under the over-all direction of Duke vice-president E. E. Williams, consisted of an orientation seminar and six monthly sessions of three days each. The sessions, conducted by both Duke Power officials and outside lecturers, were held at the company's Lake Hickory classroom and living facilities.

W. B. McGuire, Duke Power president, said the program was established to meet Duke Power's needs for developing management potential by giving participants the aids for self-development.

"Many firms have management development programs," Mr. McGuire said, "but we feel that ours is unusual in that the curriculum was established to meet our own specific objectives without the use of an outside management development organization."

He listed these objectives as: (1) providing a climate that encourages potential managers to develop themselves, (2) providing opportunity for potential managers to gain greater management skills, (3) determining individual progress by periodic appraisal and (4) providing a reservoir of key personnel, whose potentialities are known, to fill executive and administration vacancies as they occur.

Subjects included effective communication, organization and management, coaching and counseling, public utility accounting, public utility financing, public utility regulation, public utility taxes and tax structures, human relations and basic economics.

Stage one of the course required four one-day meetings at which Duke Power Co., its organization, its policies and operating practices were delineated. The second state involved a re-appraisal of the participants and formed a basis for the planning of the third stage where the aids to self-development were presented.

A second group of 33 participants has completed stage one of the program and other groups will follow.

Average age of the participants was 44, the youngest participant's age being 31. In the second group of 33 participants, now in the course, the average age is 41 and the minimum 30.

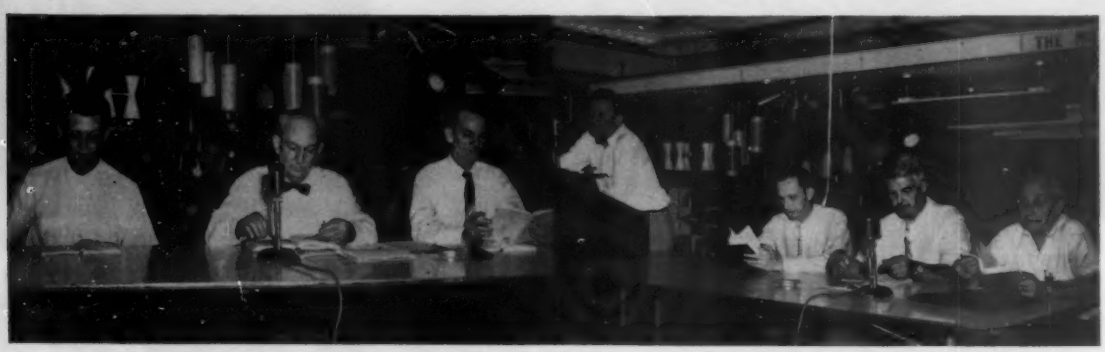
Leased lighting plan released to industry

SMITHCRAFT and General Electric Credit Corporation have announced a new nation-wide leasing plan by which modern fluorescent lighting can be installed in old or new buildings on a five-year rental or time-payment basis. The plan, called Smithcraft Lease-Light, permits owners or tenants in the United States and Canada to rent or finance lighting modernization, or new construction, while freeing working capital for other uses. The total contract price can be as low as $1,250 with or without installation costs. There is no upper limit.

Smithcraft's vice-president of marketing, George T. Wood, in commenting on the plan, said, "Smithcraft had to cut through a maze of red tape to set up the plan to fit our normal distribution channels. We sign a contract directly with the user while permitting him to choose his own electrical contractor. Payments by the user are made to General Electric Credit Corp. Smithcraft pays the distributor and contractor. We think that this plan will open a substantial new market in the relighting and new construction fields wherever there is a shortage of working capital. Users can now save their capital to reinvest profitably in their business while getting the benefits of the best of modern lighting."

Smithcraft's complete line of commercial and industrial fixtures and light-and-sound-conditioned ceilings are available under the Lease-Light plan for as little as ¾¢ per square foot per month in factories and stores, 1¢ per square foot per month for schools, and 1¼¢ for office areas, based on the average cost and recommended lighting levels for these areas.

The Smithcraft Lease-Light plan has been described as an important



LEAGUE SPONSORS CODE STUDY—An important activity of the recently organized Atlanta Electrical League has been a series of Code study sessions attended by up to 200 contractors, electricians, and others interested in a better understanding of the Code. Under the general supervision of Dewey L. Johnson, superintendent of electrical affairs for Atlanta, the meetings featured a panel of Code experts who discussed Code problems at two-hour sessions held once each month. Shown here is the panel which functioned at the last meeting. Left to right: D. C. May, Bush-May consulting engineers; Joe Whitner and Cecil Jones, both of South-Eastern Underwriters Assn.; Mr. Johnson; Earl Blakely, consulting electrical engineer; D. B. Mills, Underwriters Laboratories, Inc.; and A. M. Hitt, Economy Elect. Supply Co.

step forward in the current business trend toward economical rental financing. By making modern fluorescent illumination available under a lease agreement, Smithcraft Corporation recognizes the growing philosophy among business firms that the true value of equipment lies primarily in its use and the benefits derived from its use, rather than only its market value.

Another factor in favor of the Smithcraft Lease-Light Plan is the growing realization among owners and tenants that well-designed fluorescent lighting equipment is an indispensable part of modernization. Time and time again, in virtually every type of installation, comfortable, pleasing, fluorescent illumination has played an important part in increasing sales, boosting morale and worker efficiency and increasing overall profits.

Arkansas power company names Canaday president

PAUL O. CANADAY, of Little Rock, was recently elected president of the Arkansas Power and Light Co. At the same time, Robert E. Ritchie, Little Rock, was re-elected chairman of the board and chairman of the executive committee.

Reeves Ritchie, Pine Bluff, was promoted to vice-president and will continue to serve as personnel director with headquarters in Pine Bluff.

Paul O. Canaday

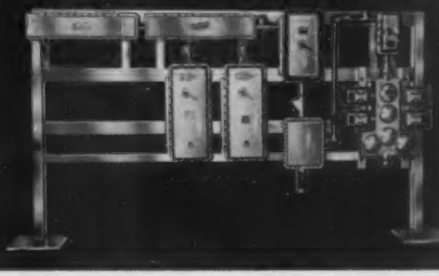
Mr. Canaday, who has served as executive vice-president since September, 1958, becomes the fourth man to serve as president of the state's largest power supplier. He was graduated by the University of Tennessee with an electrical engineering degree in 1926, and served some 12 years with Tennessee Public Service, in various engineering and management positions. Leaving Knoxville in 1938, he worked as a utility consultant in New York City for six years.

Since 1944, Mr. Canaday has been affiliated with Arkansas Power and Light Company and the associated electric utilities in the Middle South System.

Vice-President Reeves Ritchie, has

Killark custom-made switch racks...

designed and built to meet your needs... exactly



Your worries are over from the moment you choose Killark custom-made switch racks because Killark provides a complete service — design to assembly. First, Killark prepares and submits a preliminary blueprint of the entire unit, drawn to your specifications. After approval, the switch rack is assembled, wired, and sealed *at the factory* by Killark workers with experience and equipment to do the job right. You receive a switch rack ready to install.

The two racks shown are examples of the type of custom-made units Killark can provide. Each has been made to meet the users exact specifications, and is completely pre-wired and pre-sealed. Killark's rust-proof, non-sparking *aluminum* enclosures have been used throughout the assemblies to give added years of trouble-free performance.

You get these extras when you order Killark custom-made racks:

Services of expert Killark engineers • One supplier for all components • Dependable Killark aluminum enclosures • Fast delivery • Easy installation.

Racks for outdoor or indoor, hazardous or non-hazardous locations. Write for complete literature.

Killark ELECTRIC MANUFACTURING CO.
Vandeventer and Easton Aves. • St. Louis 13, Mo.
Sales Representatives and Warehouse Stocks in Principal Cities
6021

Killark Supplies Everything But the Current!

been elevated to an officer of the company after 23 years' service which he began as a mechanic's helper at the Little Rock Power Plant. From 1945-51, he served as assistant per-

Reeves Ritchie

sonnel director in Pine Bluff. After working from 1951 to 1958 as assistant to the central division manager in Pine Bluff, he was promoted to personnel director in August of that year.

Contractor should sell, NECA head tells NAED

"THE ELECTRICAL contractor should shoulder the major burden of the sales responsibility for the electrical industry in the construction market," Harold A. Webster, president of the National Electrical Contractors Association, said before members of the National Association of Electrical Distributors at their 52nd annual convention held recently in Dallas, Texas.

Mr. Webster told the audience that the NECA and NEMA should sit down together and work out their problems, starting with a clarification and understanding of the primary sales responsibility of the electrical industry in the construction market.

"The man with direct control over the ability to deliver customer satisfaction is the one who has the most potent sales tool," said Webster, "and the contractor should assume a major share of the sales effort."

The NECA, he believes will be making a great contribution if it develops a method of finding people who like to sell. provides such training as may be required and makes them available for employment by electrical contractors.

"At least 50 per cent of the salesmen now employed by the supplier should be employed by the contractor," said Mr. Webster, "and this along with other problems and misunderstandings must be worked out by the industry."

Speaking also on the subject of salesmanship, F. J. Close, vice-president of the Aluminum Company of America, said that creative selling is

Dates ahead

Southeastern Woodpole Conference, University of Florida, Gainesville, Fla., Aug. 23 - 25, 1960.

National Rural Electric Cooperative Assn., Region I, Annual Meeting, Commander Hotel, Ocean City, Md., Sept. 8-9, 1960.

Illuminating Engineering Society, National Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa., Sept. 11-16 1960.

National Rural Electric Cooperative Assn., Region VIII, Annual Meeting, Motel Arlington, Hot Springs, Ark., Sept. 12-13, 1960.

National Rural Electric Cooperative Assn., Region II, Annual Meeting, Kentucky Hotel, Louisville, Ky., Sept. 15-16, 1960.

Public Utilities Association of the Virginias, 42nd Annual Meeting, The Greenbrier, White Sulphur Springs, W. V., Sept. 15-17, 1960.

Southeastern Electric Exchange, Accounting Conference, Tides Hotel, St. Petersburg, Fla., Sept. 29-30, 1960.

American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill., Oct. 9-14, 1960.

National Rural Electric Cooperative Assn., Region II, Annual Meeting, Henry Grady Hotel, Atlanta, Ga., Oct. 10-11, 1960.

Florida Assn. of Electrical Contractors, Annual Convention and Electric Show, Deauville Hotel, Miami Beach, Fla., Oct. 12-15, 1960.

National Rural Electric Cooperative Assn., Region IV, Annual Meeting, Stonewall Jackson Hotel, Clarksburg, W. Va., Oct. 13-14, 1960.

National Rural Electric Cooperative Assn., Region X, Annual Meeting, Baker Hotel, Dallas, Texas, Oct. 17-18, 1960.

IAEI, Southern Section, Rice Hotel, Houston, Texas, Oct. 17-19, 1960.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Shoreham Hotel, Washington, D. C., Oct. 20-21, 1960.

Power Industry Computer Application, 2nd National Conference, Chase Hotel, St. Louis, Mo., Nov. 9-11, 1960.

Southeastern Electric Exchange, Sales Conference, Henry Grady Hotel, Atlanta, Ga., Nov. 16-18, 1960.

Some of those participating in the recent NAED meeting in Dallas, left to right, Art Hooper, executive director, NAED; George W. Provost, Jr., retiring president of NAED; B. H. Boatner, vice-president, eastern region; Harold A. Webster, president, NECA and N. J. MacDonald, president, NEMA. This was the organization's 52nd annual convention.

everybody's business and that everyone should take a good hard look at the selling business whether we happen to be in outside sales, behind a counter or in a management function.

"Creative selling," said the Alcoa executive, "begins with enlightened self-interest. People don't just buy products, they buy product benefits. They buy what the product will do for them."

The president of the National Electrical Manufacturers Association, N. J. MacDonald, called for closer banding together within the electrical industry, and said that when strong, well-financed associations work together they can speak to the public of the benefits of electricity in all areas of life and the public will listen and respond.

The NEMA president also revealed that the association has now been decentralized and is now in the process of being reconstituted in a pattern aimed at retaining the best of its tried and proved practices.

In his annual address to members of the NAED, executive director, A. W. Hooper said that distributors can be proud of their position in the electrical industry and the fact that they have expanded sales of electrical goods which in turn has expanded employment and elevated the standard of living.

Mr. Hooper also took issue with unstable pricing situations within the industry, and called for manufacturers and distributors to work together for solid business principles throughout the industry.

Shortage of service in air conditioning

AN OVERWHELMING shortage of qualified air conditioning service men will soon plague the public, the industry, and organized labor; unless immediate steps are taken to intensively train increased numbers of service men for this work, warns Daniel M. Brown, president of the Refrigeration and Air Conditioning Contractors' Assn., of Chicago.

"Because air conditioning now exists in less than 20% of office space, 1% of industry plants, and in only a minute percentage of homes, new systems will continue to be installed at the present high rate for the next ten to fifteen years. Each new installation will require competent service and maintenance throughout its life. The replacement market will also add heavily to the demand for air conditioning service," Mr. Brown points out.

"With an inadequate supply of skill creating great pressures for use of unskilled men for this work, the public will likely experience both excessive costs and dissatisfaction with operation of equipment unless steps are now taken to create a larger source of servicing skill."

Announcing **2 New Industrial Products from EDWARDS**

entrance register

switchboard push button panel

Edwards new In-dicator system keeps track of key personnel. Telephone operators or receptionists can tell who's in at a glance, without wasting time or using noisy voice paging systems. Ideal for offices, plants, schools and institutions.

1 PERSONNEL IN-DICATOR

- When flipped by key personnel, toggle switches on entrance register automatically carry "in-or-out" data to switchboard panel.
- operator presses button adjacent to individual's name—lamps indicate "in-or-out".
- individual executive desk switches can be substituted for switch on entrance register panel.
- both systems install easily and quickly.

From Edwards long experience in annunciator systems comes this completely new line of lamp annunciators...developed in cooperation with leading utilities, chemical process and industrial plants. Here are some outstanding features:

2 INDUSTRIAL LAMP ANNUNCIATORS

- flexibility of indications—modular "plug-in" construction permits simple establishment or change (from the front) of operational sequences without altering terminals, connectors, or jumpers.
- wide selection of operational sequences to cover all requirements.
- indicating circuit provides extra contacts and terminals for data logging or other control functions.

EDWARDS

THE EDWARDS SELLING TEAM

Selected electrical distributors across the country stock and sell Edwards products. Recognized electrical contractors install them. Edwards technical representatives in 58 cities throughout the United States and Canada work with them from initial planning through installation and follow-up, to guarantee complete satisfaction.

Edwards Company, Inc.
Norwalk, Connecticut

Please tell me more about the following products:

☐ the new Personnel In-dicator. ☐ the new Lamp Annunciators.
☐ both the In-dicator system and the Lamp Annunciators.

Name_____

Title_____

Company Name_____

Address_____

Mr. Brown reports that the association he heads became aware of this problem several years ago and organized a school for training young men in this field.

Low-voltage wiring pushed by bonus plan

THE PYRAMID Instrument Corp., Lynbrook, N. Y., is wholeheartedly supporting the NECA stand concerning the importance of the contractor "selling up" with the introduction of a new "Bonus Sales" program for its Remcon low-voltage systems division.

The Remcon "Bonus Program" is designed to have the manufacturer absorb part of the learning costs of the contractor's first installation of Remcon low-voltage wiring systems. Upon completion of his first Remcon installation, the contractor returns a signed certificate to Pyramid and receives a $50.00 package of additional Remcon material at no extra cost.

The basic Remcon package consists of sufficient low-voltage equipment for a single complete installation. It includes low-voltage relays, switches, assembly plates, mounting brackets and master controls.

In addition, Pyramid is providing electrical contractors with a complete selling program devised to help him sell low-voltage lighting systems. Material sent regularly by Pyramid, offering sales techniques, information and literature to help sell low-voltage, is offered to electrical contractors under the bonus program.

Another part of the program is a free planning and consultation service. Contractors will be able to have factory engineers plan the most economical and practical method of laying out specific jobs with low-voltage for them upon request.

New office building of Copperweld Steel Co., Wire and Cable Div.

Brief news notes of manufacturers

CONSTRUCTION on a new three-story office building in Glassport, Pa., for the Wire and Cable Div., Copperweld Steel Co., was recently begun, F. E. Leib, vice-president in charge of that division, has announced.

Designed by Batillo & Loretta, Pittsburgh architectural firm, the new building will feature window-wall construction, with an area of approximately 15,000 square feet. Bess Construction Co., Elizabeth, Pa., has been granted the construction contract, and is expected to complete the structure by spring of 1961. The Wire and Cable Division's headquarters staff will be housed in the new building.

• • •

BURNDY CORP., of Norwalk, Conn., manufacturer of electrical connectors, announced today another step in its long range program of broadened service to the electrical industry. The company has contracted to acquire, for 32,721 shares of Burndy common stock, the assets of Husky Products, Inc., of Cincinnati, Ohio, a small but successful company with sales of well over $1,000,000 annually.

Husky designs, manufactures, and sells aluminum and steel supporting tray for supporting power and control cables in the wiring systems of electric utility and industrial plants. Since Husky's products are distributed through the same channels as are employed by Burndy's U-I Division, it will be affiliated with that division.

• • •

THE JAMES F. BURNS CO., of Philadelphia, Penn., recently moved into a unique new plant at 1601 Industrial Highway, Pennsauken, N. J. Built of steel construction, the structure allows a 100-foot clear span with no columns. Manufacturing capacity is expected to increase at least 300 per cent in the new location, largely due to the one floor operation now possible. Burns manufactures a complete line of NEMA enclosures, both fabricated and cast.

• • •

THE NEW KAISER CENTER, in Oakland, Calif., providing executive and general staff offices for the more than 50 affiliated companies of the Kaiser industrial organization, is a showcase of aluminum electrical products.

In the 28-story structure, a majority of the 24,000 lighting fixtures are equipped with aluminum egg crate diffusers, and aluminum is used extensively in other special lighting

SEGCO'S NEW PLANT ON LINE—The first two of four 250,000 kva units of Southern Electric Generating Company's new steam plant near Wilsonville, Alabama, are now in operation. Owned jointly by Georgia Power Company and Alabama Power Company, this new facility will eventually add 1,000,000 kilowatts to the generating capacity of the two companies. 230 kv lines extend from the plant to Leeds, Anniston, and Montgomery, Ala., and to Morrow and Columbus, Ga.

New Kaiser Center features aluminum products almost exclusively.

fixtures. Because of aluminum's low cost, light weight, and electrical properties, the building features an economical installation with a number of unusual features, including exclusive use of No. 10 aluminum wire for lighting circuits.

In addition, the 2,000,000 feet of aluminum conductor represents one of the largest installations of its kind in a commercial building. All wire and cable, except cellular floor and minor control cable, are aluminum.

* * *

AN IMPORTANT advance in the steel industry's increasing use of automated equipment has been achieved by Youngstown Sheet and Tube Company. Long one of the nation's leading producers of conduit, the company has recently increased its conduit production capacity more than 80% by the installation of a fully automatic conduit processing machine. The new processing line eliminates much handling time, reduces finishing time, bundles tubing automatically, and paints conduit both inside and out.

The conduit line, designed and manufactured by Hanson - Van Winkle-Munning Company, Matawan, N. J. is 325 feet long and cuts production time from five hours to less than one hour. As an added bonus, the conduit emerges from the machine with a lustrous galvanized finish instead of the dull finish previously produced.

* * *

THE JONES PHILIBERT CO., Inc., 358 Sauve Road, New Orleans 23, La., has been appointed to represent the Crescent Insulated Wire and Cable Co., Inc., of Trenton, N. J.

The appointment was announced by Holt A. Murray, vice-president of the Crescent company.

Facts of Light!

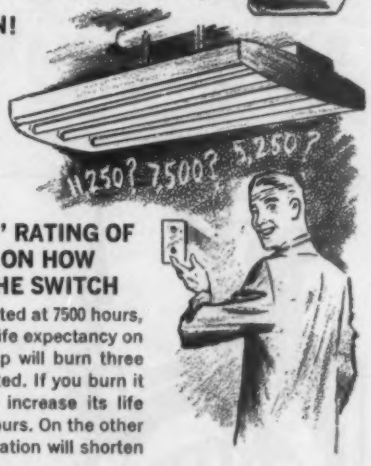
CHAMPION Lamps

TUBES ARE MORE ECONOMICAL THAN BULBS BUT —

For lighting systems in general, incandescent lamps have a relatively low initial cost and a relatively high operating cost. Just the reverse is generally true for fluorescent lamps. In the long run, fluorescent lamps prove the most economical. In the average school building, for instance, fluorescents begin to be more economical in from 3-4 years. However, incandescents would provide the most light for an initial expenditure.

LIGHT BULBS ARE A BARGAIN!

50 years ago a 100 watt bulb cost $1.45. In fact, if 1910 production methods attempted to supply today's demand, a 100 watt bulb would cost about $4.10. Today, you can buy a much better 100 watt bulb for 25 cents list.



THE "7500 HOUR" RATING OF A LAMP DEPENDS ON HOW OFTEN YOU FLICK THE SWITCH

When a fluorescent lamp is rated at 7500 hours, the manufacturer bases this life expectancy on the assumption that the lamp will burn three hours for every time it is started. If you burn it ten hours per start you will increase its life roughly 50% to about 11,250 hours. On the other hand, one-hour per-start operation will shorten its life to about 5,250 hours.

MANY COST-SAVING HINTS IN THE CHAMPION LIGHTING MAINTENANCE MANUAL

This manual explains the principles and advantages of good lighting practice in 48 pages. Included are sections on group replacement of lamps, cleaning programs and a guide to trouble shooting fluorescent installations. This is the latest edition of a guide that has proved to be of great practical value to lighting men everywhere. Write for a free copy.

CHAMPION LAMP WORKS, Lynn, Massachusetts

CHAMPION INCANDESCENT-FLUORESCENT • *YOUR BEST BUY IN LAMPS*

News about people

D. M. Parrish, of Dallas, Tex., has been named manager of R T & E Corporation's new distribution transformer plant in Arlington, Tex.

Mr. Parrish has been a manufacturer's agent for R T & E since June,

D. M. Parrish

1948. Before then, he was midwest sales manager for the James R. Kearney Corp., of St. Louis, Mo. He is an electrical engineering graduate of Iowa State University.

The Wakefield Co., Vermilion, Ohio, announces the appointment of **Gene Stephens** and his associate, **Allen Stoehr** as their sales representatives in Northern Texas.

Mr. Stephens entered the electrical business in Oklahoma City. Later he moved to Dallas and in June of 1959 he established his own agency.

His associate, Allen Stoehr has been associated with Dallas electrical firms since 1950. In September of 1959, he joined the Gene Stephens Sales Agency.

J. W. Gaines, formerly assistant division manager in Louisiana Power & Light Company's Northern Div., has been named division manager of that company. Mr. Gaines' appointment to the post was made last week by **G. C. Rawls,** president of LP&L. He replaces **A. O. Evans,** who retired June 1.

Mr. Gaines studied electrical engineering at LSU two years, and completed his engineering studies by correspondence with American Schools. He joined LP&L in 1930, when he was placed in charge of the power plant at Amite.

Fullman Manufacturing Co., manufacturers of floor boxes and conduit clamps, has appointed **Arthur H. Swartz** as their sales representative for the South Texas area.

Mr. Swartz has opened a new Houston warehouse at 2120 Polk Ave., to handle products from Fullman, as well as from the Shalda Mfg. Co., Inc.; Elliott Electric Products Co.; and the Columbia Cable and Electric Corp.

Harry L. Stillman, president of Bell Electric Co., Chicago, announces the appointment of four new sales representatives in the South and Southwest.

Jim King of King Sales Co., Robindell Dr., Houston, Texas, will cover southern Texas for the company.

Gene Stephens of V. E. Stephens Sales, 4122 Commerce St., Dallas, Texas, will serve as representative for northern Texas, as well as maintain a warehouse stock of Bell Electric merchandise to speed customer service.

Wilson P. Byrd, 1920 Sullivan St., Greensboro, N. C., will cover North and South Carolina and southern Virginia.

Jim Laubersheimer Associates, P.O. Box 1323, New Orleans, La., will cover Louisiana, Mississippi, and Mobile, Ala.

New sales representatives for Texas and Georgia have been named by Vickers, Inc., Electric Products Div., St. Louis, Mo.

Fred Gross and Co., P. O. Box 1926, Dallas 21, Texas, will represent Vickers semiconductor products in Dallas, San Antonio, and Tulsa.

W. E. Cook and Assoc., Box 13197, Sta. K, 1335 Lavista Rd., N.E., Atlanta 24, Ga., will represent the company's Magneclutches and Magnebrakes, dry magnetic particle clutches and brakes.

Three new Southern sales representatives have been announced by Kerrigan Iron Works Co., Nashville, Tenn.

The new appointees include: **Gene Johnson Co.,** Birmingham, Ala.; **T. A. Haish,** St. Petersburg, Fla.; and the **C. W. Lehner Co.,** Atlanta, Ga.

Three fieldmen have recently been added to Line Material Industries' field engineering staff.

R. G. Peck is a field engineer

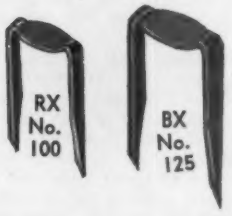
T. M. ®

"SNAPER" STRAPS
T. M. ®
FOR THIN WALL & RIGID CONDUIT

THE SNAPPER

SNAP ON—STAY ON

THE STANDARD . . .
. . . THE ORIGINAL
"NOB" STAPLES
T. M. ®



There is a difference- Why take less?

W. W. CROSS & CO. — JAFFREY, N. H. — FASTENERS SINCE 1869

General Sales Agents _____ J. J. WALSH COMPANY _____ Greenville, R. I.

serving customers in the Charlotte, N. C., area. He is a graduate of the University of Miami and has a background in the industry.

James E. Winderweedle with headquarters in Atlanta, Ga., has assumed the field engineering duties of Brady Stoughton, who has moved to the Tampa, Fla., office as district manager. Mr. Winderweedle received his engineering degree at the University of Florida.

Bill Sorrell, an electrical engineering graduate of Alabama Polytechnic Institute, has been assigned to a field engineering territory with headquarters in Pensacola, Fla.

Transferred within the field engineering staff is **Flynn Chamblee,** formerly an L-M field engineer, who has been named lighting engineer for the Southwest regioa. He will serve customers in Texas, Oklahoma, and New Mexico. His headquarters will continue to be in Dallas.

Cecil R. Pickens has been named insulated products sales manager of the Electrical Conductor Div., Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. **J. Carl Ferguson,** division sales manager, made the announcement.

The newly created position will include responsibility for all field sales

Cecil R. Pickens

and headquarters support activities relating to insulated conductor products manufactured at the company's Bristol, R. I., plant.

Mr. Pickens was formerly division technical manager at the Newark, Ohio, wire and cable works. He joined Kaiser Aluminum in 1957 when the firm acquired the Wire and Cable Department of the United States Rubber Co.

Meyer-Orens Co., Inc., manufacturers' representatives, with headquarters in Miami, Fla., has recently established a branch office at Tampa, Fla. **Jack K. Boyle** will be in charge of the Tampa office.

Hubbard and Company has named **Hal J. Harris** a district sales manager in their southwest division. He will cover New Mexico and the northwest portion of Texas.

Mr. Harris, a Baylor graduate, has had electrical apparatus sales experience in the Dallas area.

Raymond Martin has been named chief engineer, distribution and transmission of hardware for the A. B. Chance Co. The appointment was announced by **C. H. LeVee,** vice-president, engineering, of the Chance Co.

Raymond Martin

Mr. Martin has been a regional engineer in Pittsburgh for the company for the past 15 months. He has previously held other engineering positions with other companies. He is a graduate of the University of Kentucky.

Retirement of **Clarence P. Andrew,** manager of merchandising of the electrical department of Noland Co., Inc., Newport News, Va., has been announced by **Lloyd U. Noland, Jr.,** chairman of the board.

Mr. Andrew joined the company in 1938, with the inauguration of the firm's electrical department, and served as general manager until late last year, when he was named manager of merchandising.

The appointment of **Charles E. O'Toole** as general sales manager of announced by **Harry L. Stillman,** company president.

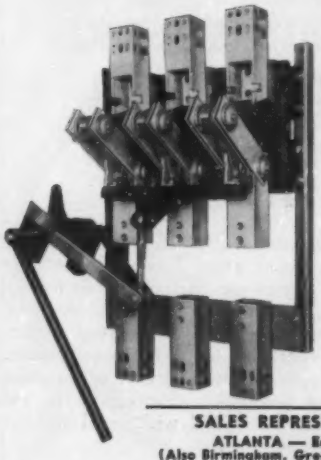
Mr. O'Toole will co-ordinate the company's national sales and promotional efforts from Bell's Chicago office. He has been active in the sales aspects of the electrical field for many years prior to his Bell appointment, having been sales manager for A. H. Massey, Inc., of Derby, Connecticut.

Arthur J. Conley was appointed manager of conduit and building wire sales, National Electric Div., H. K. Porter Co., Inc. He formerly was assistant to the divisional sales manager.

Mr. Conley joined National Electric in 1953 as a sales representative in the Detroit Branch. He is a

THE **KAM-LOK SWITCH**

With pressure contacts FOR MOUNTING IN MODERN SWITCHBOARDS



- 1200-6000 Amperes; 250 and 480 volts
- For Amp-Trap, Bussmann or G-E current-limiting fuses
- More compact for smaller switchboard dimensions
- Booster spring for quicker break if opened under load
- Hollow terminals, twin jaws and 4 blades per pole give less "skin-effect" heating and more cooling surface.

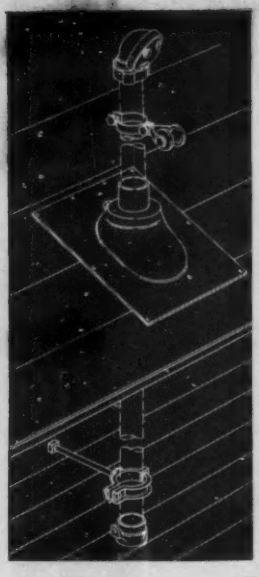
SALES REPRESENTATIVES THROUGHOUT THE SOUTH

ATLANTA — Edgar E. Dawes & Co., 405 Rhodes Bldg.
(Also Birmingham, Greenville, Tampa, Jacksonville, Cleveland, Tenn.)
DALLAS — Wynne Sneets Co., 2nd Unit Santa Fe Bldg.
(Also Houston, Little Rock, Oklahoma City, Lubbock)
NEW ORLEANS—Associated Manufacturers Agents, 900 Carondelet St.
RICHMOND—Robert W. Fishburne, 1725 Arlington Road (Also Raleigh)
WASHINGTON, D. C. — Ramsey Electric Co., 337 Southern Bldg.

The KAM-LOK Switch is accepted by the Electrical Inspectors of most major cities in the South and by switchboard manufacturers serving the area.

THE KELEK [k] COMPANY

259 DAVIS AVE. NORWOOD, MASS.



Make installations fast, built to last with

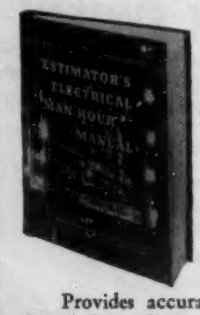
M&W SERVICE ENTRANCE MAST KITS

Now, you can have exactly the right fittings for any mast installation...quickly...at lower cost. Just select the M&W Mast Kit to fit your needs. Varied assortments for 1¼", 1½", 2" or 2½" sizes, split-clamp or pipe strap conduit support, make it easy for you to pick the one kit that best suits your requirements. Best of all, M&W Kits cost less than individual fittings.

Kits include all necessary parts for mast installation as illustrated, except conduit. Fittings available separately.

New Catalog 59 gives details and prices on complete line of electrical fittings. Write for your copy today.

M&W Electrical Fittings
The M. & W. ELECTRIC MFG. CO., Inc.
EAST PALESTINE, OHIO



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graduate of Duquesne University, and attended Xavier University Graduate School.

Wilson O. Vaughn has been appointed manager of the Baltimore district of Allis-Chalmers Industries Group.

Mr. Vaughn, who had been a sales representative in the Richmond district since 1951, succeeds **G. H. Carden.** He came to Allis-Chalmers in 1949 after obtaining his mechanical engineering degree from North Carolina State College.

Mr. Carden, who has been with Allis-Chalmers since 1930, has transferred to the Richmond district as a sales representative. He is a graduate electrical engineer of Alabama Polytechnic Institute.

W. M. Johnson has been appointed manager of the utility section of Allis-Chalmers' St. Louis district.

Mr. Johnson joined Allis-Chalmers in 1945. He is an electrical engineering graduate of South Dakota School of Mines and Technology.

C. Merle Call has been named sales manager of the Holan Corporation of Georgia, according to a recent announcement by **R. R. Rector,** vice-president and general manager of the company. Also receiving appointment from the company is **Donald Rex Mansfield,** who has rejoined Holan after Army service.

Merle Call

Mr. Call was southern regional manager for the Kayio Div., Owens-Illinois Glass Co., prior to joining Holan.

Mr. Mansfield, who lives in Tallahassee, Fla., was with the Holan firm for one year prior to his two-year Army service.

J. E. Fontaine, southern district manager for the Graybar Electric Co., Inc., announces the appointment of **W. M. Pearson** as manager at Chattanooga, Tenn.

Mr. Pearson began his career with the company in 1941 in the warehouse at Atlanta. In 1948 he was transferred to Chattanooga, and in 1949 he was made manager, lamp sales. He has been manager, lighting sales there since 1958.

Virgil S. Price, left, Tampa Electric's advertising and publicity manager, accepts awards presented by Elton E. Stuenckel, chairman of the 37th annual Better Copy Contest sponsored by the Public Utilities Advertising Association. The Tampa firm won awards in three categories in the annual competition.

Warren Bateman, manager, advertising department, Georgia Power Co., was elected a director of the Public Utilities Advertising Association at its 39th annual convention held recently in New York. He was re-elected national publicity director.

The association represents 210 electric and gas companies in the United States and foreign countries.

F. A. Dunewald has been appointed sales representative for eastern Missouri and southern Illinois by The Kirlin Co., Detroit, Mich. The announcement was made by **Paul D. Cornelisen,** sales manager of the company.

James F. Burns Co., Pennsauken, N. J., has announced the appointment of **I. Arnold Hoge,** 489 Overbrook Drive, N.W., Atlanta 18, Ga., as their agent covering Georgia, Alabama and eastern Tennessee. Burns manufactures one of the most complete lines of electrical enclosures covering every NEMA enclosure, both fabricated and cast.

Daniel A. Schisler, who has been general sales manager of the Wakefield Co., Vermilion, Ohio, has been elected vice-president-marketing of that company; and **Carl A. Schroeder,** secretary and factory superintendent, has been elected vice-president-production.

Mr. Schisler is a graduate of Miami University, Oxford, Ohio, and before becoming general sales manager of Wakefield, represented the company for ten years in the Texas sales territory. Mr. Schroeder received his B.S. degree in Mechanical Engineering from Case Institute of Technology, in 1920.

Technical books

for the electrical man

Lighting design

"Footcandle Levels and Interior Lighting Design," published by the Large Lamp Division of Westinghouse Electric Corp., P. O. Box 388, Bloomfield, N. J., 60 pages, illustrated, 10c.

This revised edition contains recommended footcandles for a myriad of industrial, commercial and residential applications, information on distribution and light measurements, precalculated footcandle tables. It also contains information on coefficients of utilization and maintenance factors, together with footcandle tables, for various types of luminaires and light sources, data on fluorescent, incandescent and mercury vapor lamps, and information on ballast losses.

In addition, the booklet contains sections on interior wiring, including uses and types of building wire, allowable current-carrying capacities of insulated conductors, information on power factors and line current, hints on selection of feeder and branch circuit wire sizes, methods of estimating the capacity of a new wiring installation, and a list of standard wiring symbols.

Electric space heating

"Proceedings and Papers of the First National Electric House Heating Exposition," published by the National Electrical Manufacturers Association, 155 East 44th St., New York 17, N. Y. 232 pages, $5.

This comprehensive handbook covers many facets of the fast-developing electrical space heating industry. Bound to be the "bible" of this exciting new field for the electrical industry, the book contains a wealth of information from on-the-job experts on technical, merchandising, installation and growth aspects, plus many others.

The volume contains transcript of 47 valuable papers and talks given at the Symposium held in connection with First National Electric House Heating Exposition.

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PORCELAIN RECEPTACLES

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OPEN-TOP WIRING — ready for immediate wiring — speedy and easy installation without removal of the interior mechanism. DUST-PROOF (Completely enclosed) INTERIORS with extra large binding head screws that are backed out and staked. Replaceable interior gives absolute satisfaction on full rated loads with performance that far exceeds Underwriters' Standards. Porcelain Receptacles No. 1736 and 1924 are pull-chain, three piece with shadeholder groove. For 3¼" or 4" box.

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New products

Aluminum lugs on load centers

A complete line of 100-ampere QO circuit breaker and FSP fusible load centers with aluminum lugs is now available from Square D Co., Detroit, Mich. These standard devices, approved for service entrance use, now permit the use of either aluminum or copper conductors. The lugs are suitable for the maximum size O wire, either copper or aluminum, and are also approved for double conductor applications.

The QO circuit breaker load centers are available as 100 or 125-ampere main lug only and split bus devices in 6, 8, 12, 16 and 20 circuit sizes. 12, 16 and 20-circuit main breaker devices are also available for use with aluminum cable. Type FSP fusible load centers cover the complete 100 to 200-ampere range with series and parallel devices.

Write P-717 on reply card, pg. 17

Horizontal beam floodlight

A new floodlight with a vertical beam spread of only 8 degrees, and a horizontal beam spread of 100 degrees, now opens up floodlighting possibilities that haven't existed with previous round or oval light pattern floodlights. The new Wide-Lite Lumitor floodlight is manufactured by Wide-Lite Corp., Houston, Texas,

and uses the remarkable new quartz-iodine lamps which do not grow dim during their long lifetime.

The quartz-iodine lamp life is conservatively rated at 2,000 hours, as compared with 1,000 hours for an ordinary incandescent lamp. It has a mean efficiency of 22 lumens throughout its life, while an ordinary incandescent lamp has a mean efficiency of 14.5 lumens per watt. These remarkable gains in lamp life and mean efficiency are obtained because the traces of iodine gas in the lamp catch the particles of tungsten that evaporate from the hot filament, and return them to the filament. As a result, the tungsten particles are not deposited on the inner surface of the glass wall, as in ordinary lamps. The glass wall does not darken, and thus reduce lamp efficiency. Filament life is more than doubled.

An aiming device permits accurate aiming of the light's unusual beam pattern. And because the quartz-iodine lamp must be operated within 4° of horizontal, a level is built into the Lumitor housing.

Write P-718 on reply card, pg. 17

Fluorescent school luminaire

Lighting Products Inc., Highland Park, Ill., announces a new line of Trend Series fluorescent luminaires specially designed to provide high-level illumination for schools and offices, at recommended standards for visual comfort.

Unique design of the new luminaires includes attractive, completely luminous wrap-around side panels. Together with efficient diffusers, the design results in higher foot-candle

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This new, entirely different estimating guide has 200 completely worked out charts.

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(July 1960)

LATROBE ADJUSTABLE CAST IRON BOX NOW

ONE POUR OPERATION

This No. 130 cast iron, adjustable floor box comes with 3½" or 4½" brass cover plate and 2" abandon plug for power or ½", ¾" or 1" for telephone service. All adjustable boxes are equipped with ground wire.

A 2 part tin lid is provided in order to pour concrete to very top in one operation. After concrete is hardened, the top part of the 2 part tin lid can be removed along with top adjusting section providing all the room you need for wiring.

Listed under re-examination services of Underwriters Laboratories, Inc.

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For hanging ½" thru 1½" pipe or conduit to steel beams up thru ⅜" thick—parallel or at any angle—no drilling necessary. Ideal for confined areas.

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levels than provided by conventional fixtures, with greater visual comfort. Brightness ratios closely approximate the Illuminating Engineering Society's "scissor curve" criteria for determining visual comfort.

A choice of three diffusers is offered with LPI's Trend Series luminaires: clear ventrolens, white ventrolens, and a polystyrene egg-crate louver providing 55 degree shielding both crosswise and lengthwise.

Write P-719 on reply card, pg. 17

Outdoor post lantern

A NEW PLASTIC outdoor post lantern is now available as part of the new Scotch plaid line of Virden Lighting, 5209 Euclid Ave., Cleveland 3, Ohio. Special plastic construction means years of weather-proof lighting. SP-7817 is white, trimmed in brass. This

lantern is distinctive, yet low priced. Diffusers are non-breakable plastic, which are easy to clean. The height is 18½ inches, cage 15 inches x 10 inches; it fits any standard 3 inch post and is 100-watt amp size. Also available is the black with brass trim style.

Write P-720 on reply card, pg. 17

Sculptured look in lighting

SUNBEAM LIGHTING, 777 E. 14th Place, Los Angeles, 21, Calif., and Gary, Ind., has combined the Sculpturama design with the Holophane Prismalume acrylic lens panel to achieve a new sculptured look in lighting. The unit's all-curved styling brings a "softer" friendlier atmosphere to commercial interiors. Its blend of gentle curves results in low brightness control both from the illuminated metal sides and the prismatically sharp Prismalume.

Prismalume is a single, inwardly curved 1-foot by 4-foot (nominal) acrylic lens panel with reinforcing prismatic crosswise ribs.

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Life-long resistance to discoloration is assured with this lens panel. The sturdily framed panel may be opened from either side on full-length "hook-on" hinges. The new Sculpturama is an extremely shallow, surface-mounted unit with no visible hardware to mar its clean look.

Write P-721 on reply card, pg. 17

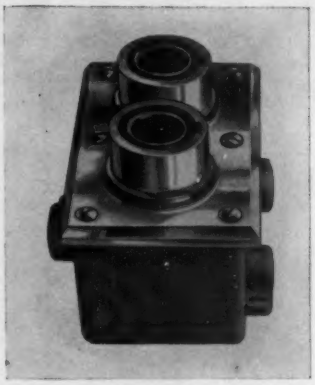
Duplex dead-end receptacle

A duplex dead-end receptacle unit, "CPSH," for use in hazardous locations, has been announced by Appleton Electric Co., Chicago 13, Ill.

Designed specifically for flush wall mounting, this unit includes Appleton's dead-end contact feature, which confines all arcing, if any, within the plug combustion chamber of the dead-end receptacle. It thus affords dual protection by eliminating any live contacts exposed to hazardous area atmospheres.

All "CPS" series Unilets are specially designed for use in atmospheres which contain volatile or inflammable fumes, or explosive vapors. These units are listed by Underwriters Laboratories for use in Class I, Groups C and D hazardous locations. Because of this double protection, this "CPSH" Unilet has met with wide acceptance in both the hospital and industrial fields.

Write P-722 on reply card, pg. 17



Allen-Stephens entrance head

A new 1-¼-inch entrance head on a 2-inch hub (for 2-inch masts) has been introduced to the market by Allen - Stephens Conduit Fittings Corp. of Woodside, N. Y.

The entrance head features an extended hood for maximum protection against weather, and has extra roomy head for easier handling of wire, giving less insulation strain. Case hardened screws also assure a positive grip on conduit.

Sturdy construction allows for abusive handling and provides for permanent installation of the new entrance head, which can be assembled against a wall, with no offsetting of conduit needed.

Write P-723 on reply card, pg. 17

Compact, thin exit light

"WAFER THIN" 50 line by McPhilben Lighting, Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y., is one of the most compact Code-regulated exit light fixtures ever manufactured. The device features all cast aluminum construction with precision-stenciled face or glass inscription panels, two-circuit wiring for either incandescent or fluorescent lamps, for 120 or 277 volt systems, and integral downlight, providing illumination of doorway in the event of an emergency. A new, patented, internal cast hinge-and-lock eliminates all external hardware, and the door remains in an open position for relamping.

The design is built for surface,

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BEGINS WITH
A *Quality* PRODUCT

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ARMORED CABLE

For America's finest armored cable, insist on American Bonded. Its superior handling properties save time and money on installation. And rigid production standards assure years of round-the-clock, trouble-free service life regardless of conditions. Be sure you've got the best in your armored cable jobs . . . that's American Bonded!

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wall, ceiling, pendant, extending bracket or recessed mounting, with gleaming satin aluminum finish and baked-on, clear lacquer protective coating to compliment any prestige decor in office buildings, hotels, schools, theatres, and other such public locations.

Write P-724 on reply card, pg. 17

Hubbell grounding receptacle

A new duplex, safety-grounding receptacle called "Twinsafe" has just been introduced which protects both children and adults from dangerous electrical shock. The new device protects two ways. First, it shunts current harmlessly away from metalic objects inserted in the slots by chil-

dren or careless adults. Second, it has a U-shaped slot for grounding power tools and appliances equipped with plugs having U-shaped grounding blade.

These hazards no longer need exist in modern homes and public buildings. The new SG-62 "Twinsafe" Safety-Grounding Receptacle made by Harvey Hubbell, Bridgeport, Conn., not only provides an easy means of grounding appliances, it also makes it impossible for objects inserted by children to touch any part that is carrying electric current. In fact, the only time that current can flow out through the slots is when both blades of the proper plug-in cap are firmly in place in the receptacle.

Write P-725 on reply card, pg. 17

Walker Trenchduct system

Used on cellular steel deck or in concrete floors, Trenchduct, made by Walker Bros., Conshohocken, Pa., is manufactured from 14 gauge steel and is protected against corrosion by Walker's Dualcote organic finish. Trenchduct can be furnished in special designs to meet requirements, but is normally furnished in sections 8 feet long, in widths of 9, 10, 12, 18, and 24 inches, and in 2-1/2-inch depth. Cover plates range from 3/16-inch to ½-inch in thickness, made in sections 1, 2 or 4 feet long, are made of aluminum or steel, and feature a molding to protect floor finishing material.

Special designs of Trenchduct have been made with widths up to 30-inch and depths from 1-1/2-inch to 6-inch. Interior partitions can be included, if required. Some Walker designs eliminate cross straps for ease in installing cables. Walker Trenchduct Systems include end units, X units, tee units, horizontal and vertical elbows, bushings to connect Walker No. 2 or No. 4 duct to sides of trench, and bushings for running cables through sides or bottom of trench.

Write P-726 on reply card, pg. 17

Lock-cover outlet unit

A new, weatherproof lock-cover assembly, ruggedly made and tamper-proof, was recently introduced by the Perfect-Line Mfg. Corp. of Hicksville, L.I., N. Y. This unit offers positive protection against unauthorized use of electrical equipment and/or control over the operation of special circuitry, machines, tools, appliances, etc., in industry or in the home both outdoors and indoors.

The application-engineered one-gang WSL-1, pictured here, and the two-gang WSL-2, were designed for

all-weather exterior and moisture-laden interior installations. They are two more units in the wide variety of P-L weatherproof assemblies and electrical devices available.

Featuring die-cast aluminum snap-caps, aluminum cover plate and stainless steel hinge-springs for long, trouble-free service, the WSL-1 comes complete with rubber mat, self-sealing rubber gasket, mounting screws, precision lock and 2 keys. The 2-gang WSL-2 comes with two individual snap-type lock-covers. Both may be had with choice of duplex switch, duplex receptacle or any switch/receptacle combination.

Write P-727 on reply card, pg. 17

Harvey aluminum conduit

Improved conduit performance and reduced handling and installation costs are the prime advantages offered to electrical contractors in the new line of rigid aluminum conduit now being fabricated by Harvey Aluminum, Torrance, Calif.

The primary aluminum producer announced that it is in full production on aluminum rigid conduit, elbows, and couplings in a full range of standard trade sizes up to 6 inches. Larger sizes also can be produced to

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90° TOMIC FLEX - STEEL CONNECTOR WITH HINGED SNAP-CAP

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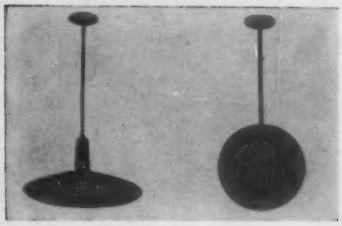
meet trade specifications. The new aluminum rigid conduit is fully listed by Underwriters' Laboratories, Inc. Every section is marked R. C., carries an individual Underwriters' label, and meets the specifications of the code on rigid conduit. It is being marketed through regularly established electrical supply distributors.

Write P-728 on reply card, pg. 17

Halo pendant fixtures

HALO LIGHTING Products, Inc., 155 East Ohio St., Chicago 11, Ill., announces the addition of two new-style units to the Halo line, the "Ellipse" and the "Pendant Sphere."

The Ellipse is available in either pendant or surface style, in 14-inch, 18-inch, and 22-inch globes. A variation of this series was recently chosen as one of the British "Designs of the Year 1959." The imported, hand-blown opal glass provides soft downward and upward illumination. Pipe and trim are in satin-brushed aluminum.



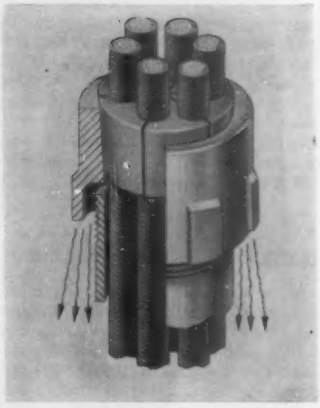
The Pendant Sphere is available in 12-inch, 14-inch, 16-inch, or 18-inch globe sizes. Here too, the imported, hand-blown opal sphere distributes light softly and evenly, and reflects the influence of continental design in modern lighting. Pipe and trim are in satin-brushed aluminum.

Write P-729 on reply card, pg. 17

Adalet cable supports

A line of "Wedge lock" cable supports for use on vertical conduit runs has been designed to simplify installation and support four times the cable weight specified by the national electrical Code, including thermoplastic-insulated cable.

Developed by The Adalet Manufacturing Co., Cleveland, O., the support employs a vented, cast-aluminum body that is threaded to the conduit. Cable is supported and locked by tapered phenolic inserts that fit around the cables and into the aluminum body. Inserts are drilled with undersize holes for each cable size, and are available for one to six cables and for use on up to 6 inch conduit. The inserts completely surround and grip approximately 90 per cent of each cable circumference, minimizing unit load on cable insulation.



Locking action is initiated by inserting the tapered phenolic grip sections around the cables and into the cast-aluminum body, and tapping the mating parts firmly into place. Dead weight of the cable applying tension on the grips, increases holding power of the unit by means of the wedging action that takes place.

Write P-730 on reply card, pg. 17

Adhesive for mounting boxes

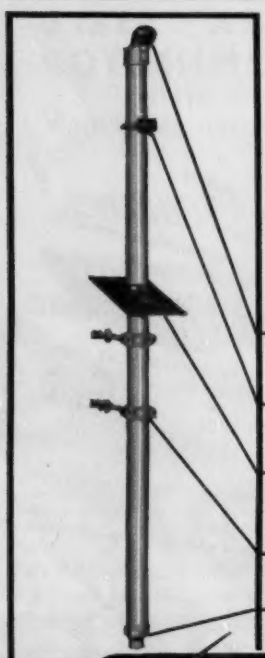
Mounting outlet boxes without drilling, without screws, and without nails is now possible through the use of Plastic Steel, made by Devcon Corp., Danvers, Mass.

A combination of 80 per cent steel and 20 per cent extra strength epoxy plastic, this material will bond junction boxes and other fixtures to steel beams or machinery, wood, cinder block, brick, and concrete quickly, easily, and permanently. The resultant bond is stronger than the concrete itself.

No heat or pressure is required. The Plastic Steel and hardening agent are simply mixed and applied to the back of the box. The box is then positioned against the wall and supported until the Plastic Steel has hardened. In about one hour the box can be wired in the usual way.

One pound of Plastic Steel is sufficient to attach 50 boxes.

Write P-731 on reply card, pg. 17



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4. **Mounting brackets** — New combination bracket accommodates 1-¼, 1-½, 2, 2-½ and 3 inch pipe. Available with ½ inch thru bolts or with lag screws.
5. **Offset reducer** — Corrosion-resistant aluminum alloy. Fits 1-¼" and 1-½" hubs to a 2" or 2-½" pipe riser and 2" hub to 3" pipe riser.

The better-made parts in a Blackhawk kit let you do a fast and sound job on every service entrance mast installation. Saves you time, builds your reputation for quality and service.

Specify B-I when you buy!

Blackhawk Industries

DUBUQUE, IOWA *where the new ideas come from*

Helpful literature

available to our readers

Publication of a six-page bulletin on "Lawn-master Pole Star" **distribution transformers** has been announced by **Pennsylvania Transformer Div.**, McGraw-Edison Co. These transformers are surface-mounted units for use with underground distribution systems. The entire line is covered in Bulletin D-360, which includes photographs and descriptions of major components, details of principal features, connection diagrams, and tables of weights and dimensions.
Write B-732 on reply card, pg. 17

A new catalog, "All Purpose **Centrifugal Fans**—Series 3000", is available from the Sturtevant division of **Westinghouse Electric Corp.** The 76-page booklet describes the complete line of Series 3000 Westinghouse fans with flat, backwardly inclined blading. These fans are suited for a number of applications: supply and exhaust, general building ventilation, industrial air conditioning, vehicular tunnel ventilation, and industrial processes.
Write B-733 on reply card, pg. 17

The **Century Electric Co.**, St. Louis, Mo., has issued a new 1960 **Motor Application Guide.** This guide is a 16-page bulletin (Bulletin 270B) which outlines Century motor characteristics and includes up-to-date information on Century motor designs.
Write B-734 on reply card, pg. 17

Bulletin GEA-7201, ten pages, outlines value of **floodlighting**, application data and product information on full line of filament, mercury vapor and fluorescent units available from **General Electric.** Photos show typical applications in recreation area, architectural and ornamental lighting, billboard illumination, loading platforms and industrial areas. Brief outline also discusses "How to get more light per dollar."
Write B-735 on reply card, pg. 17

A new 30-page illustrated booklet, "The Fundamentals of **Splicing and Terminating Rubber-Neoprene Cables**", Bulletin 1134, has been issued by **The Okonite Co.**, Passaic, N. J. The bulletin contains step-by-step information on the splicing and terminating of both shielded and unshielded cables. Also included are tape selector and quantity estimating charts, product information, and a purchase planning aid sheet.
Write B-736 on reply card, pg. 17

A theater lighting catalog recently issued by **Century Lighting, Inc.**, New York, N. Y., contains 101 pages of authoritated information on all types of **stage lighting.** Lighting layouts for ten different types of performance areas are included, ranging from the simple lecture platform to a large outdoor amphitheatre. Architectural details and light specifications are included.
Write B-737 on reply card, pg. 17

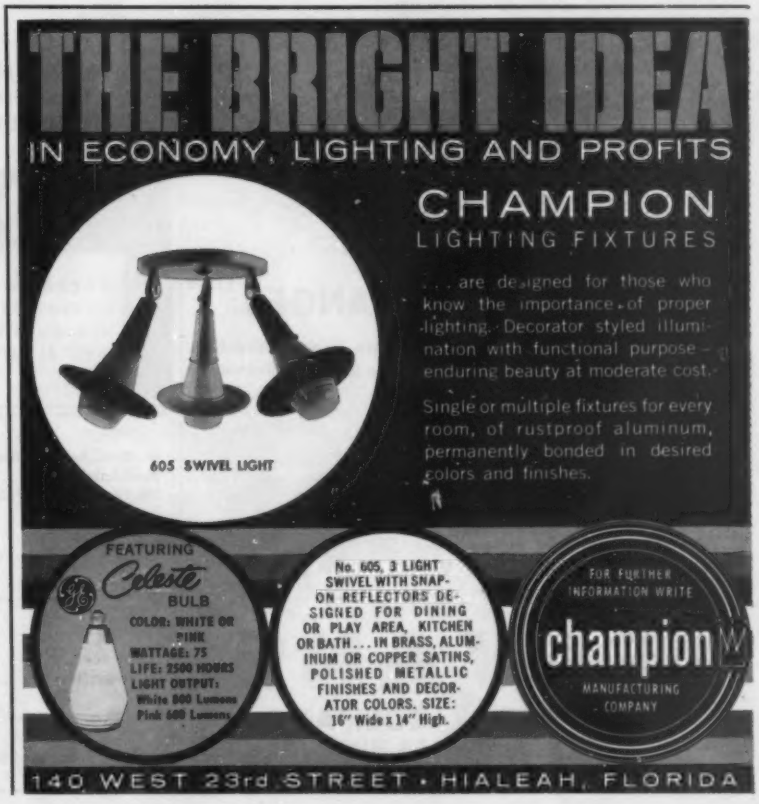
A new 28-page catalog, "Bushings By Lapp" is announced by the **Lapp Insulator Co., Inc.**, Le Roy, N. Y. Lapp Bulletin No. 546 lists **apparatus bushings** for transformer, circuit breaker and special purpose applications in a complete choice of types, sizes and ratings. Featured are the Lapp POC (Paper-Oil-Condenser) and POC-A (Paper - Oil - Condenser - Adaptable) lines of condenser type, oil-filled transformer and circuit breaker bushings, 15kv - 230kv. Other bushings are also included in this comprehensive catalog.
Write B-738 on reply card, pg. 17

A new 8-page, 2-color bulletin on **starters for central air conditioning applications** has been published by **EC&M Div., Square D Co.**, Chicago, Ill. The bulletin gives detailed information on full voltage, reduced-voltage, auto-transformer and wye-delta starters in ratings ranging from 208 to 4900 volts. Electrical characteristics are also provided.
Write B-739 on reply card, pg. 17

Catalog No. 25 now available from **Rawlplug Co., Inc.**, New Rochelle, N. Y., is a **masonry anchoring** handbook describing methods and products for fastening anything to masonry. Designed especially for engineers, architects, and users of masonry anchors, it describes the Rawl products and shows how to use them.
Write B-740 on reply card, pg. 17

Explosion-proof fittings for hazardous locations are featured in a catalog recently issued by the **Killark Electric Mfg. Co.**, St. Louis, Mo. Included are junction boxes, special fittings, connection blocks, sealing fittings, unions, plugs and receptacles, switches, pilot lights and a complete line of explosion-proof fixtures.
Write B-741 on reply card, pg. 17

A key tool for electrical utilities—"Aluminum Electrical Conductors-General Engineering Data"—has been revised and greatly expanded by **Aluminum Company of America's Rome Cable Div.** The publication lists immediately available sag and tension charts for covered and bare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aluminum conductors, and ACSR (Aluminum Conductor, Steel Reinforced). The original publication listed nearly 4000 charts available from Alcoa; the revision lists an additional 600 charts.

Write B-742 on reply card, pg. 17

Bulletin GEA-7061, 16 pages, contains detailed information about new smaller, lighter, 50-kilovar **capacitors** and pole-type equipments made by **General Electric Co.,** Schenectady, N. Y. Units are designed to provide fixed and switched capacitor banks for power systems. Bulletin emphasizes significance and benefits to utilities of new 82-pound, 50-kilovar units and offers graphs, detailed construction features, outline drawings, ratings, weights, dimensions and group fusing data.

Write B-743 on reply card, pg. 17

Fiberglass **street light globes** are shown in a new four-page brochure now being offered by **Plastic Age Sales, Inc.,** Mint Canyon, Calif. Excellent light transmission combined with light weight and exceptional resistance to breakage are prime features detailed in the brochure. Features of the new globes are shown with test data facts. Temperature, weathering, shock and heat factors are covered in brief explanatory sections. How the globes will fit all major models of popular luminaires is also illustrated.

Write B-744 on reply card, pg. 17

A new, pocket-size general catalog is now being issued by **Anderson Electric Corp.,** Birmingham, Ala. The new catalog measures only 5 by 5 inches yet contains complete indexes and other specification data on all Anderson **connectors, clamps, and fittings.**

Write B-745 on reply card, pg. 17

Vapor-tight lights are completely covered by a new catalog supplement issued by the **Killark Electric Mfg. Co.,** St. Louis, Mo. The catalog illustrates complete lines of aluminum fixtures, including pendant, ceiling, and bracket types for every conceivable installation. A full range of reflector styles are also described—shallow bowl, standard dome or angle. Included, too, are a full line of accessories, adaptor plates and hangers.

Write B-746 on reply card, pg. 17

A new 12-page booklet on use of **industrial capacitors** to reduce power costs and increase system capacity is now available from **Westinghouse Electric Corp.,** Pittsburgh, Pa. The booklet answers many questions concerning application of capacitors for industrial use. Subjects covered include: a discussion of power factor, benefits of capacitors, how to select capacitors, and where and how to apply them.

Write B-747 on reply card, pg. 17

New six-page folder by the **Wiremold Co.,** Hartford, Conn., includes a complete, yet comprehensive, list of **portable electrical appliances,** compiled as an aid in planning for adequate outlets. Average wattages are given for each appliance. Advantages of the Plugmold multi-outlet system are demonstrated. Title of folder is "Housepower Use-Planner."

Write B-748 on reply card, pg. 17

Know the law

(Continued from page 100)

The court reasoned:

"Almost the entire difficulty arises from the fact that in the statutory notice from the plaintiff (the supplier of material) to Pevar, the prime contractor, the plaintiff stated that the material had been billed to Vee Jay Electric Company of Delaware, Inc. The letter, however, expressly referred to the contract number and the gymnasium job. Pevar knew that

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the subcontractor on that job was the Vee Jay Electric Company, Inc. and not Vee Jay Electric Company of Delaware, Inc.; it knew its contract with Vee Jay Electric Company, Inc., prohibited the making of a sub-contract and had investigated and resolved the possibility of such sub-subcontract. There seems no doubt that the material was furnished to the gymnasium job and, indeed, the greater part of it (the transformers) was sent direct to the original sub-contractor, and the president of the defendant by admissions stated that these transformers were actually installed upon the gymnasium work.

"It has been uniformly decided that the Miller Act should be liberally construed in aid of the evident public object—security to those who contribute labor or material for public works."

"The material in the present case was furnished by the present plaintiff; it was furnished to and for the gymnasium work, and the cost of the material has not been paid. Since the materialman had no contractual relation with the prime contractor but did have a direct contractual relation with the subcontractor, he was required to give notice to the prime contractor within 90 days from the furnishing of the last material, stating with 'substantial accuracy' the amount claimed and the name of the party to whom the material was furnished.

Precise accuracy not essential

"It will be noted that the statute requires the notice to the prime contractor to be made with 'substantial accuracy.' The language of the statute being liberally construed and applicable alike to laborers and others, regardless of educational qualifications, negatives the idea of a strict or precise accuracy. It has been determined that the object of the notice to the prime contractor was to enable him to withhold payments from the subcontractor until the materialman had been paid.

"In the present case it seems clear that the notice was received by the defendant. The defendant knew that its subcontractor was Vee Jay Electric Company, Inc., and that such company was prohibited from making any sub-subcontract. He, then, could regulate his payments to his subcontractor.

"It has also been decided that another requirement in the notice from the materialman to the prime contractor is that such notice shall, in effect, amount to the presentation of a claim for such material and that such materialman is looking to the contractor for the payment of the claim. This requirement is fully met in the notice in the present case which concluded with these words:

"As per attached statement all the material is past our terms of 30 days, we must have your remittance by the 5th of September, or we will be forced to take legal steps for this amount."

Code discussion

(Continued from page 94)

transferring heat.

Heating cables installed in concrete floors must be ". . . secured in place by non-metallic frames or spreaders while the concrete or finish is applied." A 1-inch spacing is required between the cable and other metallic objects. Leads leaving the slab must be in an approved raceway.

There are many excellent makes of electrical surface heating units which fit along baseboard, etc., in addition to the heating cables just discussed, which are becoming quite popular. Electrical heating is a potential source of increased revenue for electrical contractors who are prepared to cope with it.

Answers to Code test questions: (1. **T** Section 410-6) (2. **T** Section 410-25-a) (3. **F** Section 410-68) (4. **T** Section 410-69) (5. **F** Section 410-75-b) (6. **c** Section 422-6) (7. **a** Section 422-20-c) (8. **b** Section 422-25) (9. **c** Section 422-33) (10. **b** Section 422-35-b).

Supervisory control

(Continued from page 75)

Among the many utility applications in which General Electric supervisory control equipment has been used is the operation of complete hydro-generating stations and interconnected substations from central locations. Other applications include industrial power distribution control; irrigation and other water supply systems; commercial buildings for light and air-conditioning control; tunnel ventilation; and municipal traffic control.

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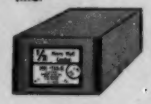

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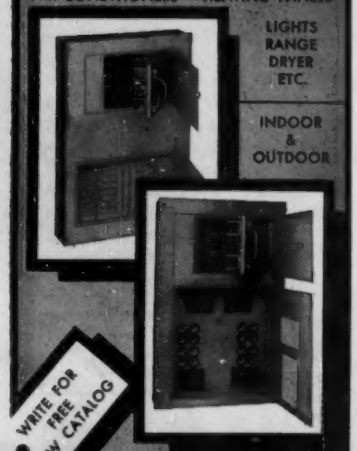

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will automatically give an accurate picture of temperatures, pressures, rate of flow and oil level in storage tanks throughout a system.

To date, two utility company orders have been received—one for control application in a power generating station, the other for control of substations.

Single or three phase

(Continued from page 59)

tion under this new policy, we have found that it gained very rapid public acceptance. A small amount of objection from a comparatively few customers was experienced at first, but in each case it was very easy to convince them that they, along with us, were benefiting from the change. To my knowledge, the company has collected the connection charge only a very few times. A handful of distribution problems were encountered, but they turned out to be very minor and were not difficult to overcome.

Based on our studies, and now on our operating experiences, the Gulf States Utilities Company is convinced that the policy is sound and will help us to obtain the residential home air conditioning business. Based on our load growth estimates, we expect to save $11,000,000 by 1970 due to this policy change alone.

I am sure that this potential home air conditioning business is available to all utility companies in our section of the country, and therefore, comparable savings should be realized. In conclusion then, may I ask the question: Can you afford *not* to serve small, residential air conditioning loads single-phase?

Photo records

(Continued from page 46)

went, since the photo serves as a guide.

In addition, when making a survey prior to submitting an estimate on alteration work, we use the photo in planning the costs, and work our estimate around it and around the existing equipment. By taking the picture to the office, whatever personnel is concerned with compiling the estimate gets a good view of the job. And in case of dispute over the work we've done, what new materials and units we've provided, or dispute over relocating the units, the before and after pictures bolster our contentions and assure our integrity, making easier the billing and collection for services rendered.

Held in picture-file form, the photos also serve to explain to prospective customers the nature, extent, and variety of our electrical services and performance.

Wiring custom homes

(Continued from page 38)

the grain of wood in paneling. Recessed lighting and pinpoint lighting over the pool table in the recreation room combine general illumination with local lighting.

To achieve different effects of illumination in different areas, dimmers were used. In the dining room dimmers may be adjusted to social or family events to create atmosphere or mood.

This home required 50,000 feet of armored cable and conduit, and more than 100 recessed lighting fixtures.

Material handling

(Continued from page 30)

against current cost price.

"This is easier, quicker, and less subject to error," said Mr. Callaghan, "than figuring charge-out prices from various supply houses' invoices."

While the shop boy is filling orders, he writes down the items that are running low in a "Want Book." This eliminates any involved inventory system. The Want Book goes to the shop foreman each day who does the ordering.

"Stocking our own inventory," said the shop foreman, "saves us better than 15 per cent. Too, we can take care of emergency calls after hours, during week ends, and on holidays when supply houses are closed for business."

As it is customary to have a minimum charge for service calls, few customers are willing to pay more than the minimum for minor service calls. " . . . and there is no way to absorb the time and cost of chasing parts."

Supply convenience

When asked, several of the journeymen admitted they disliked chasing back and forth to supply houses. One of them summed it up with these words: "It puts us in a bad light when the front office reviews our job tickets."

Mr. Callaghan will quickly admit that an inventory can be no

asset without a system.

"Having the needed materials on hand, and not being able to find them quickly involves a double waste of time. Time spent in hunting them can absorb more than the extra profit involved. And if they can't be located, and we have to go to a local supply house for them, we have wasted the time twice, not once."

Once such an inventory is set-up, it takes little time to keep it in order. The stock boy at Callaghan Electric Company works on a part time basis. He is an electrical engineering student at Texas Western, and has time to help out around the yard even on his part time schedule with the firm.

Inspectors meeting

(Continued from page 28)

2. If grouped may an outside weatherproof outlet be backed up on the appliance circuit? (Usually lawn mowers, etc. to be used).

Answer: No. (Receptacle must be grounded)

(56) Under 230-70 (No more than six disconnects) Does a trailer court with transformer vaults distributed Throughout the court, with meter locations adjacent to vaults, with meters and disconnects, and disconnects at each trailer space. Does the meter location require this main? (11 meters at each location)

Answer: Group of meters and switches installed and serviced by utility company then NEC has no jurisdiction. If installed by others violates code.

(57) 1. Discuss method of trailer grounding other than service ground.

Answer: Most trailers have grounding facilities.

2. Is it the opinion of this group that some mention of electrical wiring, grounding etc. for trailers and trailer parks be contained in the NE Code Book?

Answer: Committee assigned by NEC.

(58) Article 514-6. Under slab runs feeding pump islands, where must seals be installed? Is a coupling permitted in the pump cavity?

Answer No.

(59) Is it acceptable to use a three pole three phase circuit breaker in a 3 W SN panel to supply a sign circuit which is wired in three parts all of which are to be turned on or off simultaneously? Will there need to be more than one neutral wire pulled on this one multi-wire circuit? If so, why?

Answer: This had to do with 110/220 volt four circuits to sign. More than one neutral required - one neutral for 2 wire circuit, one neutral for one multi-wire circuit. 2 neutrals required for 4 circuits.

(60) 1. How many window air conditioners can you put on one circuit.

Answer: Two if not over 6 amperes each. If over 6 ampere each, just one.

2. Do these units need to be marked for group installations?

Answer: Not listed for group installation.

(61) Are there any restrictions against putting a convenient receptacle in a clothes closet?

Answer: No.

Reducing overhead

(Continued from page 23)

terials or interruption due to some other cause can catch such a promise in time to revise it. A bookkeeper seated two desks away can tell an estimator to pick up the phone without relaying it through the inter-com system. An office worker with an interval of time on his hands is more likely to make himself useful where he is needed than if isolated in another cubicle. In other words, we are all more productive, work is better coordinated, and the sum

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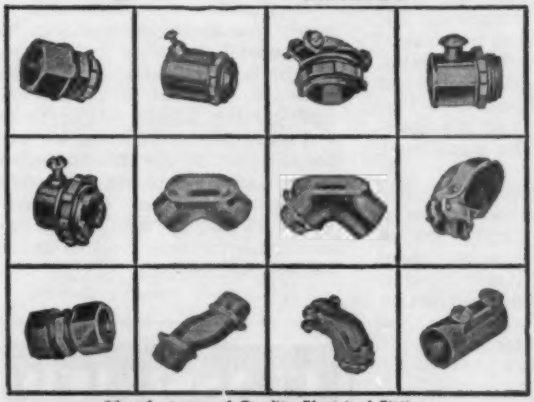

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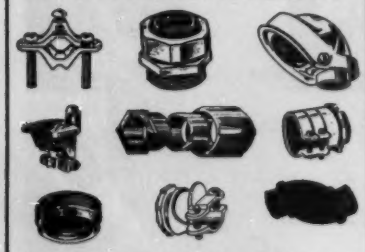

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Whatever hours a contractor spends in improving procedures will more than compensate him. Good systems and routines not only increase volume and profit but shorten hours and give a contractor greater freedom from detail.

Washington report

(Continued from page 9)

to force members of the construction trade unions off the job, the Steelworkers were engaging in an illegal secondary boycott.

With its ruling, the Board upset the recommendation of one of its top trial examiners, George Downing. One year ago Downing ruled that the Steelworkers picketing was aimed at U.S. Steel (not the subcontractors) in order to make the steel company assign some of the construction work to Steelworkers. Since the picketing was not directed at the subcontractors, it was legal, Downing said.

On the basis of the same facts, the Labor Board disagreed. The picketing was aimed at the neutral subcontractors, the Board ruled. Since the subcontractors were not involved in the dispute over jobs between U.S. Steel and the Steelworkers, the picketing was illegal, the Board said.

Henceforth, whenever an industrial union pressures employees of contractors off a construction or maintenance job at an industrial plant, the contractors and sub-contractors should be able to obtain fairly quick relief from the National Labor Relations Board.

Market lighting

(Continued from page 21)

"The fluorescent lighting system in our Oakwood Market has impressed us in many favorable ways. We chose it in planning because it offered us, with economy, the features we wanted most . . . attraction, good environment and sales power. In service it has provided all that we hoped for and much more besides.

"It has given Oakwood Market standout appearance both from the view of the street traffic and the shopper in the store. With respect to the latter we have received many compliments. These expressions are backed up solidly with the volume of business we have enjoyed.

"Our lighting has a potent effect upon shoppers. It displays and sells merchandise successfully because it translates favorable impressions into purchases. The science of marketing calls this 'impulse buying.' Well, we have it in a very desirable form which is the sum of all the design features of Oakwood Market. The lighting brings all these into effective operation."

All parties to this showplace supermarket are proud of their connection with it. Those quoted have advised that Kingsport Furniture and Electric Co. was the electrical contractor with the responsibility for delivering the features discussed as the design intended.

Economics

(Continued from page 6)

earth and evaluate the environmental factors of a community that may be responsible for business success.

It should not be assumed from the foregoing that the old plant locational factors have diminished in importance during the past decade. This would certainly be untrue. Proximity of markets, good transportation, reserves of power, energetic labor supply, all of these and many others still play an important part in the determination of new industrial plants. But today the whole process has become scientific in nature with sound research practice now creating sound business success later.

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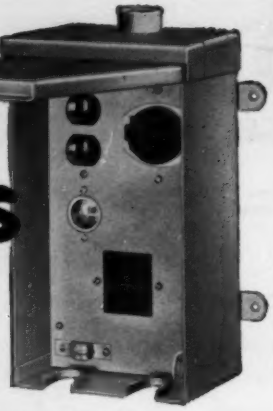

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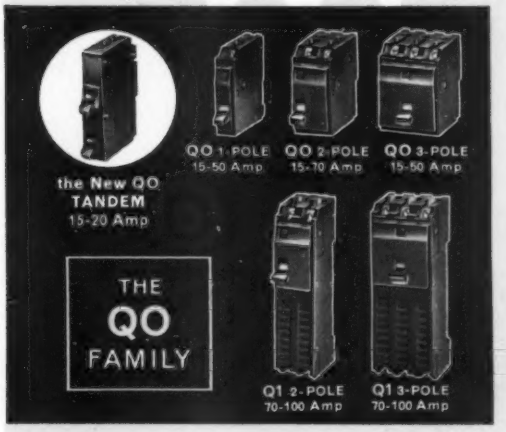
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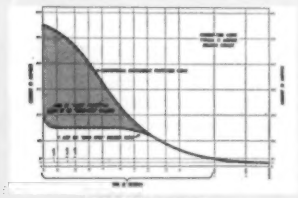

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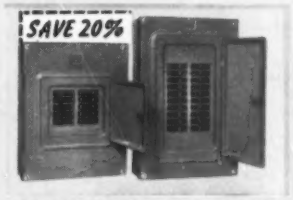

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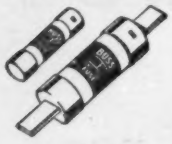

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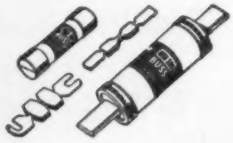

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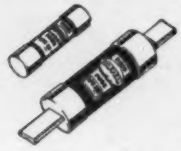

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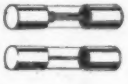

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